AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 5, No. 23. WEEKLY. | NEW YORK, JUNE 10, 1882. | $3.00 per Annum. SINGLE COPIES, 6 CENTS.

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ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

New Atomizer and Air Moistener for Factories.

In the manufacture of silk and other fine textile fabrics, particularly in the spinning process, it has been found that with a dry atmosphere, such as usually exists in factories, some of the fine threads will break from brittleness, while others will become charged with electricity and will adhere to each other through the magnetism produced. Experience has also shown that in England fine threads of silk may be spun without difficulty, such as cannot be handled in this country without moistening the air, for the reason that in England there is almost a constantly moist atmosphere, whereas in this country the condition of the air varies with every change of the wind. It has been demonstrated by medical experts that air with a humidity of about 70 per cent., or in other words, air that contains 5½ grains of water to each cubic foot, is the most conducive to health. In spinning factories where the machinery running at high speed creates electricity, under circumstances where the moisture must necessarily be extracted from the air, it becomes necessary to restore its humidity by artificial mechanical methods. The moisture must be introduced into the atmosphere in such a fine mist or fog that it shall be immediately absorbed or taken up by the air, to prevent the possibility of the minutest particles of water being precipitated upon the fabrics or fine machinery.

To accomplish this the apparatus shown by the accompanying engravings has been designed. It consists of a water supply pipe *C*, shown in Fig. 1, communicating either with a water tank in the upper part of the building, or with a hydraulic accumulator, to furnish a constant pressure which escapes at the nozzles of the atomizer, shown at *G*, Fig. 2. This atomizer consists of four arms having a nozzle screwed upon the end of each of them. These nozzles have holes in their centers of a little less than 1-32 of an inch in diameter. If from any cause these apertures become stopped they may be readily removed and cleaned. The reader will observe from the engraving that the streams of water in escaping from the nozzles meet each other at right angles, which breaks them up and distributes the liquid in the form of a fine spray. If, however, there were nothing more than these nozzles to the apparatus, a portion of the water would be precipitated in the form of minute drops and the air would also be filled with sensible moisture or particles of water. To prevent this the jets are covered by the adjustable deflectors *D D*, so that as the streams are broken and driven forward from the atomizer *E*, they strike the surfaces of these deflectors at an angle which separates the atoms more perfectly. If a coarse spray is desired, the deflectors are raised, but a finer spray or mist may be easily produced by bringing the deflectors quite close to the jet.

To allow only the fog or fine mist to escape into the air in the room, the jets are surrounded by the sheet-metal casing *A*, in Fig. 1, which arrests the drops. These drops fall into the conical-shaped bottom *B*, and are conveyed thence into the drain pipe, and filtered back into the tank to be used over again.

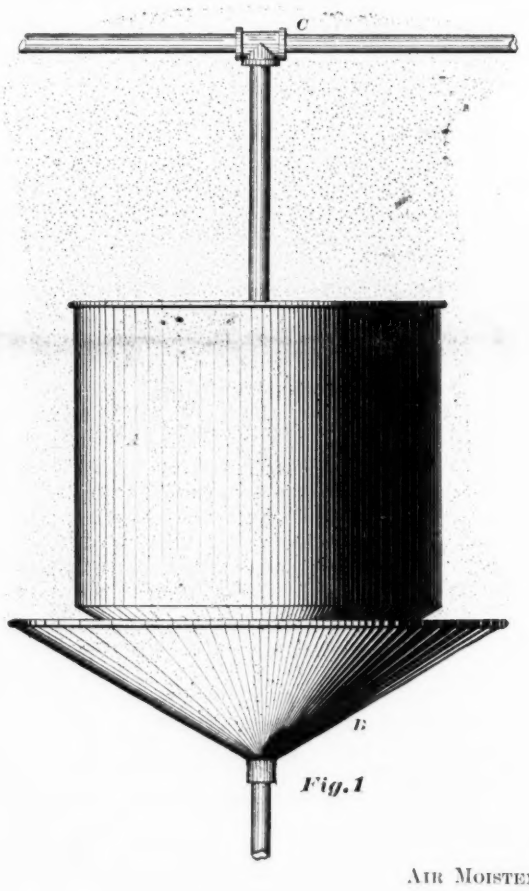


Fig. 1

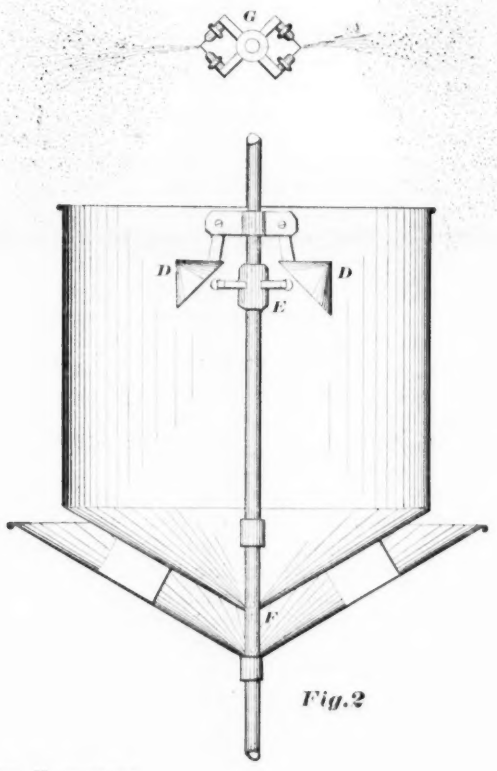


Fig. 2

AIR MOISTENER FOR FACTORIES.

It will be seen in Fig. 2 that the casing is open at the bottom, and the bottom *F* attached by pieces of sheet metal. By this arrangement all the fog that rises above the case is readily absorbed by the atmosphere, so that none whatever is precipitated in the form of water to damage finished machinery, or to cause dampness in the apartments.

To ascertain the humidity of the atmosphere, a standard hydrometer is hung in the apartments, so that the moisteners may be regulated accordingly.

It is stated that, by the use of this apparatus, at least two to five per cent. of the fine fiber usually wasted in factories may be saved, and the yarn made at least fifteen to twenty per cent. stronger. It naturally follows, then, that more material may be produced by each machine, and there will be little or no fiber flying off and floating about the room. The yarn being more elastic, it is less liable to kink and get slack; besides, the quality of goods produced is more smooth and even. Silk, cotton, woolen and linen goods are affected the same way.

In manufacturing colored goods, smutting may be prevented by using this apparatus, and any desired humidity of the atmosphere be produced and maintained. The rising mist readily absorbs the frictional electricity generated by the belts and other rapid-moving parts of machinery, as it is well known that mist or fog quickly absorbs electricity.

The fine fiber, when charged with electricity, assuming an erect position, clings to everything for which it has any affinity. In some cases the speed of machinery has had to be reduced on account of the fiber standing up and catching upon the rolls and other moving parts, causing great annoyance and damage to the fabrics. With the air in a proper condition, the speed of the machinery may be increased, with no annoyance from electricity. In spinning yarn, it is of the greatest importance that the threads should be as elastic as possible, from the fact that in weaving much fiber and starch are rubbed off by the harness, and the surface of the yarn is thereby much disturbed. Unless the yarn is very elastic, it is quite liable to break; and, in many instances, the weaver is obliged to moisten it by the application of a wet cloth, or sprinkling it with water.

In the ventilation of public buildings the apparatus here shown has been advantageously applied. It is well known that most buildings are badly ventilated and even when the air is rapidly changed by fans and other mechanical methods, it is far too dry. The effect of this is to cause a dryness of the throat, drowsiness, and a tendency towards catarrh, bronchitis, and pulmonary consumption.

In many of our churches individuals of the congregation become drowsy or go to sleep, for which they are sometimes blamed, and frequently the preacher is condemned when the true cause lies in the impure or vitiated atmosphere. With a proper amount of moisture of the atmosphere this may all be avoided, and in localities where much dust exists it may be in a great measure overcome by the introduction of a proper amount of moisture.

This apparatus is simple, requires very little attention and the possibilities of getting out of order are quite limited. The amount of water used is very small, and the cost of operating is normal. It is the invention of James Beggs of James Beggs & Co., 9 Dey street, New York.

The Auburn Mechanical Association of Auburn, N. Y., has been organized, and holds a meeting every Friday evening at haf-past seven, in the draughting room of the E. M. Birdsall & Co.'s Works. It has for its object the discussion of mechanical topics of general interest, and instruction in mechanical drawing. At the meeting May 19th the following officers were chosen: Bishop Arnold, President, James Waddell, Secretary, and H. T. Porter, Treasurer. The subject discussed at the last meeting was "The Steam Engine Indicator." The association cordially invites mechanics, and any others that may be interested, to attend these meetings. There are many other cities where associations of this kind might be started with great advantage, not only to the younger mechanics, but to those of extended experience.

Extracts from Chordal's Letters.

THE ACQUISITION OF KNOWLEDGE—EXPERIENCE OF THE COUNTRY BANKER'S SON IN A MACHINE SHOP.

Mr. Editor:

* * * * We are told that a little learning is a dangerous thing, and also to drink deep or touch not the Pierian spring. This may be all right when applied to mental and moral philosophy, astronomy, or the square root of 2; but it is glaring fallacy when applied to the mechanic art. As the scales of ignorance drop from the inquiring mechanic's eyes, he sees behind him paths of pleasant conjecture, and before him a somewhat negatively forbidding glare of certainty.

I take it to be the experience of every advanced mechanic, who is anything of an enthusiast, that his pleasures in his art have lessened as his special knowledge increased. Agathos says: "Not in knowledge is happiness, but in the acquisition of knowledge. In forever learning we are forever blessed; but to know all were the curse of a fiend."

All mechanics are not enthusiasts; all do

not advance in knowledge; all do not conjecture, and all are not so situated as to have the spirit of conjecture aroused.

* * * * A country banker's son, in his school holidays, finds himself at the open door of a machine shop. It is the only shop for a hundred miles around. Like all such shops so situated, it is called the "foundry." The boy is, perhaps, fourteen; he has never seen a railroad nor a steamboat. He has seen two steam engines, perhaps, in dusty flour mills. Horse powers, and reapers, and treadle grindstones, and whirligig egg beaters have always possessed a charm for him. He has had an investigative eye for clock movements, and knows that they have a cog wheel and a fluttering arrangement inside. He has read papers and books, and has lots of pictures, and his mind is stored with mechanical matter for ten thousand questions, if he could find any one as intelligent as himself to put them at. He looks in at the "foundry" door, and becomes instantly aware that there is something inside which he never saw, nor read of, nor heard tell of, nor dreamed of. From the door sill he looks up and sees a revolving shaft, with pulleys and belts. His wondering eye follows these belts. He sees that they lead to counter shafts, which in their turn have pulleys and belts. His eye follows these belts down to various kinds of machines, and to a man standing by each machine. This is a vision to him. He dares go no further; he goes back to school with his mind full of the whirling glimpse. He asks himself, What were those things, and what were those men doing, and what were they doing it for? The next Saturday he finds the foundry door again; he ventures inside, and finds himself close to one of these men running one of these machines; he knows the man from the machine, but he doesn't know the machine from the work which it is doing.

It is a lathe, but he never heard the word. What is it for, and what is the man for? The machine doesn't seem to be grinding anything, and the man doesn't seem to be feeding anything to it. Parts of the machine seem to be simply turning around, and the man seems to be simply watching them turn around. His eye wanders around the shop wildly and wonderingly, but he sees only mysteries repeated. But the boy is a boy, if he is a puzzled one. His looks of wonder and inquiry touch the heart of the lathesman, as such looks always do touch the hearts of lathesmen. The latter beckons the boy to him, and bows him over the lathe, and shows him a revolving bar, mostly black and rough, and brightened part of the way. The boy can see that the bright part is a trifle smaller than the black part, and that a something or other is close up to it where the black part begins, and that dirt or something is continually falling from it. Still he does not comprehend, and the man has to explain. "That is a bar of iron, and I am turning it off to make it smaller and round and nice. The lathe turns the bar around, and this tool does the turning."

The boy sees it all and begins to explain it to the man: "Oh! now I see it! This little thing is the thing you're turning, and this big thing is the thing that turns it; and this is the stuff it turns off, and you stand here to watch it. My! ain't that funny! I didn't know they could turn iron. What do they use such a big machine for? It's bigger than the piece of iron; but, say, what makes the thing keep cutting? I don't see the bar move up any."

Then the whole thing is explained, and he puts his finger on the carriage and feels it move. The man draws the tool out and lets him feel the point, and explains that iron is not hard, and he moves the carriage by hand and shows him the screw, and shows him the knob he turns to stop and start the feed, and he stops and starts the lathe, and throws the belt to show what the cone pulley is for.

The boy's active mind grasps the whole general idea, and he grows many years older in a few moments. Then he walks around the shop and sees other lathes on other kinds of work, and he sees a planer and a drilling machine, and a man chipping iron with a hammer and chisel, and then he goes out into the moulding room, and sees ugly men and pretty holes in the sand, but he doesn't know what they are for.

He goes home and tells wonderful tales, and dreams wonderful dreams.

Other holidays come, and he makes other visits and gains more knowledge of the shop and men.

* * * * Vacation comes, and the foundry takes possession of him, and he takes possession of the foundry. He is always there; the first to come in the morning, the last to go at noon or night; finds out every thing, noses around everywhere, seeks the dignity of standing by machines when no one else is by them, coats his clothes all over with grease, and is an over-willing, insistent, incorrigible, and, withal, a very happy, tolerable nuisance.

* * * * Vacation ends, and there is a row at home between the country banker and the country banker's son. In the battle both win. The boy goes back to school for one term, and then can go the "foundry" as an apprentice.

* * * * This shop seems a poor, miserable institution to us. A couple of shackly lathes, one splendid new lathe, a little old chain planer, a wooden frame bolt cutter, a drill press, weighing 300 pounds, a six-by-ten steam engine, twenty feet of line shaft, three vises, ten flat drills, two die plates, about one set of taper taps, three or four home-made plug taps, a blacksmith's fire, a few files, a noisy old blower, a cupola, some sand, some patterns, some pattern lumber, a wood lathe, six pattern maker's clamps, handsome scrap iron—these make the sum and substance of the inventory.

* * * * The men in the shop consist of the owner, who has spent all his life in shops, but who never was, and never will be, a mechanic; one hired man, who used to be a machinist, but who has been twenty years farming; three younger men taken as learners, their muscle being their principal recommendation; an old, gray-headed chap, who may some day have been a moulder, and a lively carpenter, who may some day become a pattern maker. The old machinist gets $3 a day; the young ones, $8 a week; the old moulder and the young pattern maker $2.50 a day each. The owner is the hardest worker in the shop, and is making money, as his work is all repair work, and there is no competition.

* * * * Is it reasonable to hope that the banker's boy can go into this miserable shop and become a mechanic?

Anyhow, he goes in at $5 a week for three years. He has more natural sense than all the others in the institution combined, the young pattern maker being the only man with a mind beyond the crudeness of this little shop. The routine of the boy's life is known by all except those poor unfortunates whose first view of mechanical life was a view of the thing in its full completeness.

He chipped castings, wrested with the old bolt cutter, cut bolts with the hand dies, run the drill press, and made himself generally useful. His hands got rough and bruised up, and cut, and dirt got into the cuts. He had really entered upon the sea of life and in a ship hardly seaworthy.

* * * * The boss runs the little lathe himself, and being called away frequently by other duties, gets into the habit of leaving the banker's boy John to watch it till he comes back. As a matter of fact the banker's boy John knows more about the lathe than the boss ever dreamed of, but the boss is no fool and soon finds it out and the banker's boy John becomes the lathe hand Johnnie. He does his work well and leads a life of ambition and inquiry. He reads everything he can lay his hands on, and every day he tells the old machinist something about machine work or asks the old lathesman some reasonable question which he cannot answer. He reads of twist drills but it is years before he sees one; he finds a picture of one and shows it to the old man. The old man doesn't know. The boy wants to know.

Nuts are tapped in the shop by running a blacksmith's taper tap into both sides. The boy reads of a nut tap and makes one for use in the bolt cutter on his own hook. Merit and conceit are so mixed in the act that it leaves his reputation as it was.

* * * * These blacksmith's taps are used to start plug taps, the boy reads up on the tap question. and on his own hook constructs starting taps with the outside only tapering; he organizes a set of tap wrenches. He also organizes a set of tap drills, and has many a row over them. He does not use these drills himself, and he is not the owner nor boss of the shop; but he forges these drills himself at idle times and sticks them in the board by the drill press and insists on full benefits being derived from them. This brings on a fuss every time his watchful eye catches a man reducing or spreading one of these drills. His next piece of impertinence is to find fault with the square hole in the spindle of the drill press. He puts the spindle in the lathe, cuts a thread on it and screws on a nice socket with taper hole and slot, and he makes the shank of every drill in the shop to fit it. There is not work for him every day, so he finds time enough for this nonsense about which there is no complaint; only indifference.

* * * * There are several things on this boy's mind; he wants to know what a big lathe looks like and whether a man uses a step ladder when running one. He wants to know what a boring mill is. He wants to know how the holes in the planer rail are counterbored from the inside as it seems a physical impossibility. He wants to understand the working of a steam engine. He wants to see a planer that will feed downward and a lathe that will feed across. He wants to know how a lathe carriage can be fed along by a round rod with a key way in it. He wants to know what a cutter is, and what is meant by milling, and how gear teeth are cut, and what sort of a thing a chuck is, and what an open die bolt cutter is, and what is meant by scraping, and how they plane under the inside edge of a lathe bed, and how they turn the solid pin in a cross-head, and what a reamer is like, and a rosebit, and above all he just wants to try a twist drill once. He gets all the books he can and becomes well posted on the steam engine, and becomes anxious to see one larger than 12" or some of the peculiar forms he sees in the books.

* * * * The boy has, so far, never seen a machinist except those mentioned, and they are ignorant and inexperienced and have never given him an idea which he was incapable of originating. For a wonder, the idea of a large and extensive shop has never entered his head; he has never seen one, nor read of one, nor heard of one, and has never thought of the thing.

* * * * He became an expert workman on the little lathe and on such fitting as turns up. Owing to the poverty of tools, every day calls for some impossibility, and every day he manages to see some impossible job finished.

* * * * A new day dawns on the boy in his second year. The boss has made money and the business increases; the shop is enlarged, a new 20-inch lathe is purchased, and a new man is coming from a distant world where there are lots of machinists. The boy can't sleep o' nights; he wants to see the new man. What will he be like?

The lathe comes, and Johnnie starts it up, and goes all through it and takes it all in. There is a disappointment now that he has acquired new knowledge: one of the future pleasures of life has past. He has seen a lathe with a rod feed and cross feed and a chuck.

He hears the man has come and will go to work to-morrow. In the evening he slips around and sees the man through a window. Another pleasure over. The man looks just like other men.

* * * * The new machinist is an intelligent young fellow whose entire experience has been in the Great Northern Railroad shops. He is disgusted with the little shop, but he has sense, and goes to work with a will. The little shop can afford to pay big wages. He takes at once to Johnnie, in a patronizing way, as the only tolerable element about the place. Johnny takes to him, and pumps him for month after month till George has nothing to tell which Johnny does not know.

* * * * Revelation has come to Johnny. The Great Northern shops are big; sixteen lathes, several drill presses, several planers, &c., &c. He hears of locomotives and of compound planers, and hears machinists called finishers, and an engine a "stationary;" and this man has used twist drills, and can explain scraping on a valve seat.

* * * * But George never saw a boring mill, nor a gear cutter, nor any kind of an engine except stationary and locomotives, and cannot tell how the inside counterboring was done in the planer rail And Johnny instructs George in the principles of the steam engine and in the scientific theories of the link motion, and in the general structure of beam engines, trunk engines, side-lever engines, Corliss engines and condensing engines—things which the boy has never seen except in his well-thumbed books.

* * * * When Johnny's three years are up, his wages are put at $3 per day. Three months more and another lathe is got and three new men are sent for, for Johnny to pump. They are drunken ignoramuses with nothing in them, but they excite in Johnny an irresistible desire to see the land where machinists grow. He does not recognize the fact that he is head and shoulders above the most of those whom he will ever meet. He wants to see a big shop, and a boring mill, and a gear cutter, and a locomotive. He wants to drill a hole with a twist drill, and he wants to find out how that hole in the planer rail was counterbored in the inside.

* * * * *

Very respectfully,

CHORDAL.

Electrical Apparatus and Processes for the Mining and Metallurgical Engineer.

BY N. S. KEITH.

A PAPER READ BEFORE THE AMERICAN INSTITUTE OF MINING ENGINEERS.

No one of the live subjects of the day, to which the attention of the mining engineer and metallurgist should be turned, is of greater practical interest to him than electricity in its applications to various mechanical, chemical, and metallurgical operations. The object of this paper is to call the attention of my fellow-members and associates of the Institute to various new, as well as comparatively old, developments in the science and art of electricity which seem to promise results of advantage.

Too many of the comparatively old applications have been neglected by the mining engineer, which, if he had given them a place among his appliances, would have assisted him greatly. The telegraph may be noticed as one. Its use is, however, confined to a person having skill in the manipulations of the key, the reading of the alphabet, and familiarity with the sounder. One of the simpler forms—the call-bell—has a range of application far greater as to distance and convenience than the old wire-pull, or the hoarse voice of the windlass-man or the bucket dumper. A few Laclanche cells, two or more electric bells, and a mile or more of wire judiciously placed will put the superintendent, at his office, in communication with the foreman of his mills and mines, so that by the aid of a code of signals, great advantages may be gained without necessitating a knowledge of the Morse alphabet, or of the mechanical voice of the sounder. The telephone furnishes a means of communication between the often widely separated places of duty, which will save many a step, much loss of time, and wear of horse and body. It can be used by anyone who can speak.

But I wish to call attention particularly to a description of new applications of electricity which the miner and metallurgist will find, before long, so essential to his profession, that their theory and practice will be taught in the schools the same as metallurgy, mineralogy, and chemistry now are. That which we may call the new electricity is due

to the practical development of the theory of the conservation of energy, and the consequent production of mechanism for the generation of currents of electricity of any desired quantity and intensity. So new is this electricity, in fact, that even the recent graduates of the mining schools know little or nothing of its modes of production or of its applications in practice.

I will speak of the new applications which are the result of the extensive production of machinery for generation of electricity. First comes that which appeals sensibly to the eye—light. It has been fully determined that there is no light, except daylight, as cheap as that produced by the voltaic arc; none so pure in color, none so bright Many arc lights are in use in rolling mills, machine shops, hydraulic mines, surface works, and other places. The miner needs the electric light in the shaft house, the stamp mill, and at the furnace. If he has no engine at the shaft house, the one at the stamp mill or furnace can be used to run an electric generator, so that not only his shaft houses can be illuminated, but also his mill or furnace, and even the road between, much cheaper than he can produce one-tenth of the light by the use of candles or kerosene, and with much greater safety.

It is doubtful, however, whether the voltaic arc light will be of any great practical utility in narrow veins of mines, because the light produced is too great in quantity and much more than is needed, by far, in the narrow space. Nor in the headings or slopes is it applicable, as it requires in such places too frequent moving. The work at the new railroad tunnel through Bergen Hill, at Weehawken, is successfully and economically lighted by eleven arc lights placed upon the circuit from one electric machine, two and one-half miles long. The conductors are of well-insulated copper wire, carried along the ground, upon poles, down and up the shafts, and into the various headings. The men can do more and better work in the good light. In lighting the banks at hydraulic mines, in iron-ore pits, in open cuts of railroad work, in fact in all large spaces in which night work is carried on, this light has no equal.

Take, now, some of the applications of electricity which can be used by the miner and metallurgist if he has at his main engine, or water wheel, a suitable generator of electricity. He may be sinking a shaft at the top of a mountain, where it would be impracticable to place or operate a steam engine. If he places there an electric motor, and connects it with a generator by conducting wires, he will have power at his command at the shaft, which, by the mere turning of a switch handle, will work the whim or windlass, and hoist ore or rock, or work a pump. I have an instance at hand where electricity is now used in mining for the transmission of power, in the Loire Valley, in France, at the works of the Compagnie de la Ferroniere. One Gramme machine is employed as a generator of electricity, and another as a motor attached to a drum, which stands at the head of an inclined plane 110 meters long, with a grade of 4 centimeters per meter. The generator is 1,200 meters from the motor. The road raised is about 800 kilogrammes (1,760 pounds), and the ascent is made in one minute and a half. The work goes on with great regularity. The starting and stopping can be done as gently as desired. By means of a galvanometer in the circuit one can tell at any moment what is being done at the incline, whether the work is stopped, whether the wagons are coming up filled or not, etc. The work is about ⅔ of a horse power.

By means of this current one can ignite blasts and work electric drills, which are said to be economical in comparison with the steam drill. The operator can stop and start the drill at will, and have all the advantages of mechanical movements without the constant, personal attention of an engineer at the shaft. He can light all his works from a central station at the mill, or other place where he has available power. Branch wires can be taken to the laboratory, where the electric current will aid him in his analyses and tests, and with it he can heat, boil, cupel, roast and perform all the operations of the laboratory which require heat, power, or the determination of chemical affinity. It will detect imperceptible flaws in iron and steel bars, and determine the amount of carbon in steel. Think of melting metals by the fall of water! The suggestion of it even, not so many years ago, would have secured our excommunication.

It would take too long, and far exceed the proposed limits of this paper, for me to enter into the particular modes and apparatus for carrying on the various operations which I have enumerated; but I will briefly describe a few practical operations which can be carried out on a large scale.

For quite a number of years, in the neighborhood of Swansea, in Wales, a method of refining copper, and separating such gold, silver, and other metals which the impure copper may contain, has been in practical operation on a large scale. Plates of black

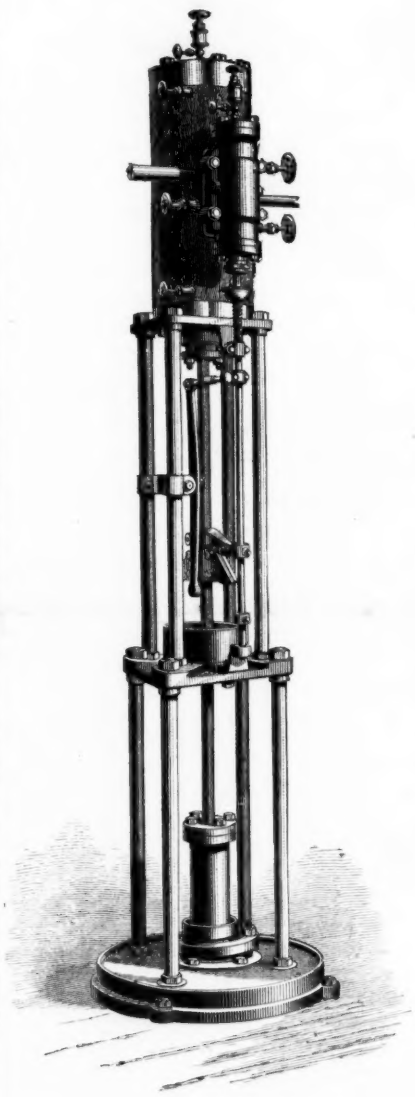


FIG. 1.

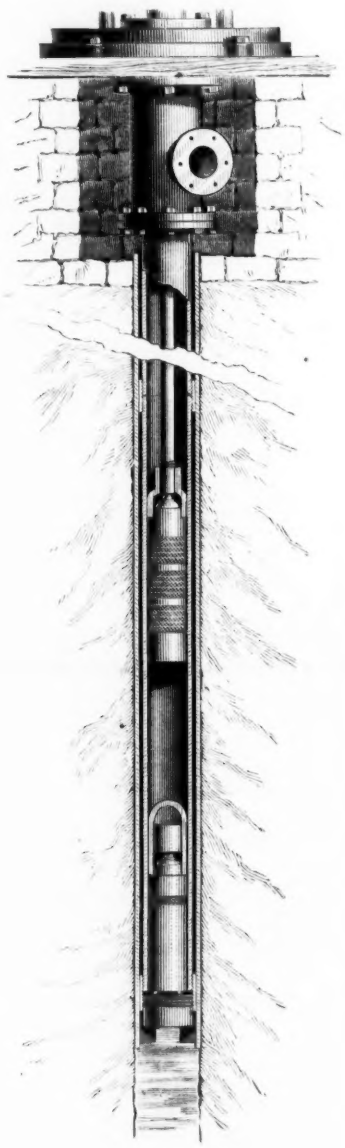


FIG. 2.

copper are made the anode in an electrolytic bath, consisting of a solution of sulphate of copper. Other thin plates of pure copper are made the cathode in the bath. By the electrolytic action of the current, produced by an electric generator, copper alone is dissolved from the black copper, and is deposited in a pure state upon the cathode. The impurities of the black copper sink to the bottom of the vat, and are removed from time to time and treated for their contents of gold and silver. The cathodes, as soon as they have reached the desired weight, are removed, and the copper thereon is melted and cast into pigs for the market. This process has been found more economical than any other for accomplishing the same result.

An analagous process is the one invented by me for the refining and desilverization of base bullion. The bullion, in plates, is placed in a solution of acetate of soda and sulphate of lead, and is so connected with the source of electricity as to be an anode, while plates of other metals are the cathode. Lead is dissolved and deposited electrolytically; and the deposit is practically pure. I have invented an improvement on this process, which consists in taking the skimmings of zinc, lead and silver, which come from the kettles in the desilverization by means of zinc, and putting them in bags as an anode, dissolving both the lead and zinc, electrolytically, and depositing them together as an alloy, or mixture, upon the cathode plates. The contents of gold, silver, etc., are retained in the bags, and are treated for these metals by smelting. The combination of pure lead and zinc is removed from the cathode and added to the next, or some other succeeding lot of base bullion, put into the kettles for desilverization, and in that manner the process continues. In place of treating the whole mass of bullion by electrolysis, I get, in the first place, by the zinc desilverization, say, 80 per cent. of the base bullion as market lead; and, say, 22 per cent. of a mixture of rich lead and zinc, which goes to electrolytic treatment. By adding, then, the pure lead and zinc to the succeeding lot of bullion, I effect the desilverization, and remove from it, as market lead, an amount approximately equal to the quantity of lead which is in the bullion placed in the kettle.

A Proposed Law to Encourage Piracy.

A bill has been passed by the House of Representatives, under suspension of the rules, by a vote of more than two-thirds of the members, which, if it becomes a law, will destroy a large part of the value of United States patents now in force and hereafter to be issued.

It provides: "That no action for damages or proceeding in equity shall be sustained, nor shall the party be held liable under Sections 4,919 or 4,921 of the Revised Statutes of the United States, for the use of any patented article or device, when it shall appear on the trial that the defendant in such action or proceeding purchased said article for a valuable consideration in the open market."

As about all the manufacturing industries of the country are based, more or less, upon inventions secured by patents, the sweeping effect of such a law must be manifest. Should it be enacted, purchasers of pirated inventions would only be required to show that they purchased them "for a valuable consideration" from any irresponsible, Tom Dick or Harry who chooses to trade upon the results of some one else's inventive abilities, without rendering any consideration for the privilege. The real infringers of a patent could, in many cases, conduct a thriving business, through selling agents, in such a manner as to be almost out of reach of such a law, for this bill does not require the purchaser of a pirated invention to testify from whom he obtained it. The party making the article may be irresponsible, or he may carry on his manufacturing anywhere, and sell his products to innocent customers throughout the country, without offering any chance for the owner of the patent to obtain redress. We need not dwell upon the widespread injustice and damage of such a law upon every productive industry. It would withdraw the main incentive to invention, and it would effectually stop the investment of capital in patented inventions, either in developing them or placing them upon the market.

Protests are being forwarded to Washington against the passage of this bill by the Senate, and manufacturers everywhere should take speedy action in letting their views upon this iniquitous project be known in the halls of legislation before it is too late.

New Artesian Well Pump.

We present herewith two engravings representing the improved direct-acting steam pump for artesian wells, manufactured by the Knowles Steam Pump Works, of 86 Liberty street, New York, and 44 Washington street, Boston. Fig. 1 represents the upper sections of the pump including the steam cylinder, and Fig. 2 the lower sections, which may be conceived as attached by the upper or flanged end to the lower end of Fig. 1.

The more common pump for use for this purpose has been of the cumbrous working-beam type, and in adapting the direct-acting pump to work from depths of several hundred feet, it is obvious that many difficulties must be overcome. As such pumps must, for obvious reasons be single acting, it is plain that the small amount of work done on the down stroke, together with the weight of the plunger and pump rod, would, with an equal distribution of steam for the up and down stroke result in such an unequal motion as to greatly endanger, if not entirely destroy the working parts. To obviate this, and at the same time to provide for an equal delivery of water on both the up and down strokes, two important and effective arrangements are applied.

Referring to Fig. 2, it will be seen that one of the lower sections (represented in the brick work) consists of a cylinder having a flanged outlook to which is connected the discharge pipe.

This cylinder is provided with a plunger, the cross-sectional area of which is equal to one-half the corresponding area of the pump bucket. When the pump makes its upward stroke, this plunger which is attached to the rod, opens room in the cylinder which admits one-half the water displaced by the bucket, the other half being forced out at the discharge. On the return stroke the water in the upper cylinder is forced out of the discharge by the return of the plunger.

This provides for continuous discharge, and assists in equalizing the work on the up and down stroke To further accomplish the end of an equalized motion, two valves are provided, operated by the hand wheels, shown in Fig. 1, to increase or decrease at will the quantity of steam admitted on either side of the steam piston.

In the engraving the foot valve is shown at the bottom of the well, being packed on the outside with a single ring to hold it in position. The movable bucket, which works in a barrel of very hard phosphor bronze, is packed with fifteen rings of composite, fibrous packing, in three distinct sections.

In the event of its being necessary to remove the lower parts of the pump, the nuts are removed from the four uprights, shown near the bottom of Fig. 1, when, by hoisting the upper sections, the bucket is removed. This manner of disconnecting provides for setting the pump back in position again, with the certainty of the alignment being correct. The foot valve can be readily grappled, or the pump chamber removed, if necessary for repairs.

These pumps will pump either oil or water from any depth up to 2,000 feet.

New Universal Milling Machine.

The universal milling machine herewith illustrated, and which was designed and is manufactured by C. E. Lipe, of Syracuse, N. Y., is the result of several years careful study and experiment; the aim of the designer having been to produce a machine capable of being readily and quickly adjusted to any of the many special operations that may be required of it, and in which all the moving parts may be set at any point within their limit of range without special preparation or change of parts; also to combine such mechanical movements as would allow of the greatest possible latitude between such limits without impairing its efficiency, and at the same time be capable of taking very heavy cuts when required.

The general arrangement of column and base, with the vertically moving knee and traveling work table, will be clearly understood from the engraving. The column is cast hollow with shelves for tools, and is provided with a door which is on the opposite side from that shown in cut. The transverse adjustment of the cutters to the work is effected by mounting the spindle and cuttter arbor, cone shaft, outside center arm and the adjustable part of the feed mechanism, on a traveling head gibbed to slide on top of the column and connected by a rack and pinion movement, which is controlled and the head located by an adjustable lever and measuring dial. Distances are ordinarily read by a friction-clamped pointer, adjustable to zero, moving over the dial. A vernier arm reading to thousandths of an inch is also provided for very accurate adjustment.

The cone shaft is at right angles to the spindle, which is driven by a hardened steel worm and bronze gear enclosed in head, which is cast hollow with two bridges across from side to side. These bridges with the shell, support the solid boxes for spindle, and form oil compartments, holding a quart or more of oil each. They are filled from a pouch on the outside. The worm gear is thus made to revolve continually in oil, ensuring perfect lubrication; each bearing is also provided with means for self oiling, in addition to the usual oil holes.

The spindle is threaded on front end, and has a hole $1\frac{9}{16}$ inches in diameter through it, tapering in front to receive the arbor. The spindle has tapered bearings, ground and fitted to boxes by scraping. The front bearing is $3\frac{1}{4}$ inches in diameter at the large end, and 6 inches long.

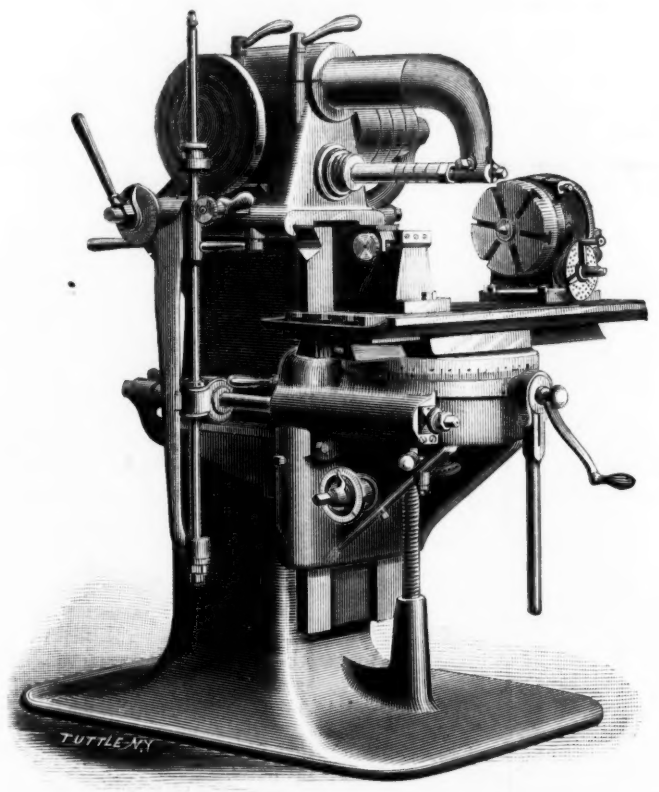
The outside center arm slides through a bearing in top of head, and may be revolved up and out of the way, or taken out entirely, and when set in position can be quickly clamped with the grip levers closing the split joint. The knee is gibbed to the front of the column with a wedge-shaped gib.

Both the gibs to the knee and head are provided with tightening screws, to which are attached permanent wrenches, held with set screws. The knee is raised and lowered with a screw operated by a bevel gear and pinion, the pinion shaft projecting through the side of knee convenient of reach. A dial having two series of graduations, one reading by the decimal system to thousandths of an inch, and the other by 16ths, 32ds, etc., measures the movement.

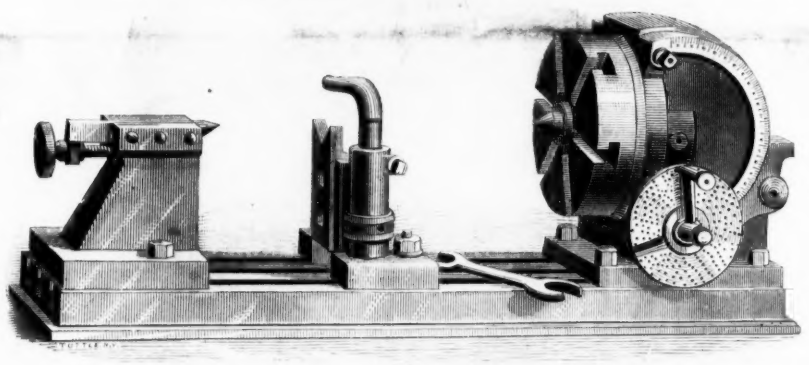
The upper part of the knee is a circular box cast open on top. The box is covered with a circular cap on which are the dovetail guides through which the table slides. This cap is recessed into the box to keep it central, and is fastened thereto by a novel application of an expanding ring, operated by a single stud which projects through the wall of the box. This ring has a > shaped groove on its periphery, which in expanding closes over similarly-beveled ledges on the inside of both cap and box. The edge of the cap is graduated for use in cutting spirals.

By this arrangement the table can be set to move at any angle with the spindles and quickly clamped, and as this ring is of large diameter (the outside diameter of box being 17″) and bears evenly round the entire circle, the cap is held as rigidly as if it were solid with the knee.

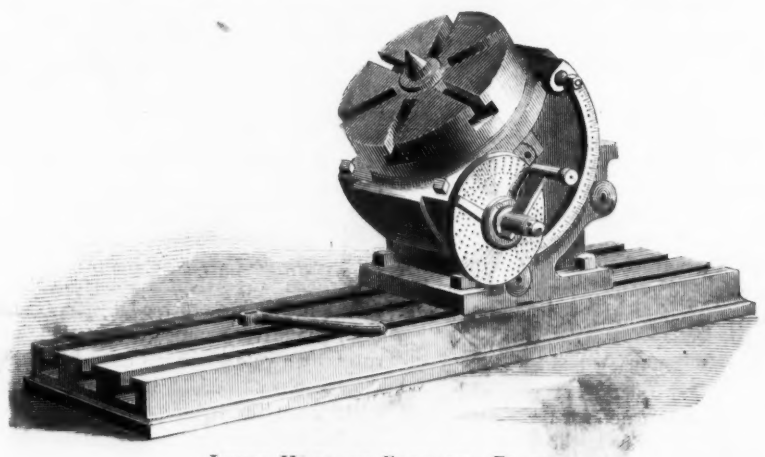
In this box, securely protected from dirt and chips, is a large worm gear secured to a short vertical shaft, on the uppper end of which is a pinion projecting through the cap and engaging with a rack recessed into the bottom of the table. This shaft also carries a bevel gear which meshes with a pinion on the end of the short shaft projecting through the front of the box for a hand crank, and also a hand lever with friction grip. The gearing is so arranged that one turn of this crank moves the table 2″, thus providing for the rapid movement of the table along its path, to facilitate getting work in and out of place.



NEW UNIVERSAL MILLING MACHINE.



INDEX HEAD CENTERS AND CENTER REST ON PLATE.



INDEX HEAD ON PORTABLE PLATE.

The automatic feed of the table is accomplished by means of a leather-covered friction disc, secured to the end of the cone shaft, which drives a vertical shaft carried by a bracket hinged to the head. A small pulley splined on this shaft, and held at any point by a spring-pressed catch, bears against the disc and may be set either above or below the center, to feed in either direction as may be desired. The pressure between the pulley and disc is regulated by an adjustable spring tension, and the feed can be set at any point without stopping the machine. This vertical shaft also carries a splined worm driving a worm gear splined on a horizontal shaft carried by the knee and a backward projecting bracket. The connection between these two shafts is thus made universal, the worm and gear being surrounded with a case which is free to slide on either shaft. A worm on the horizontal shaft engages with the larger gear in the knee completing the automatic feed. A clutch joint near the center of this shaft allows the worm to be dropped out of gear to stop the feed; also to allow the rear portion of the shaft to be disengaged from the worm portion for the purpose of obtaining a powerful hand feed, by applying a crank to the front-projecting end.

The table has three bolt slots running lengthwise, and is encircled with a pan set sloping towards one end. The front edge of this pan is raised flush with the surface of the table to make a support for overhanging work. The table can be fed its full length in either direction, and when placed so that one end will pass the column may be swung around parallel to the spindle and used as a boring mill for short holes; or, turning a complete half revolution, work may be done on both sides of a piece without resetting, thus ensuring perfect parallelism.

The index head, in design, is an entirely original conception. It is a hollow box, the outline of which is about two-thirds of a circle. The opening, in front or chord side, is surrounded by a heavy flange, and bored out as large as permissible. This forms the front-bearing of the spindle and face plate, which is cast in one piece. A rear and smaller bearing is provided on the circular part of the case. The end of the spindle projects through the case, and is held from coming out by a recessed nut and washer. The spindle also carries an accurately-divided steel gear of sixty teeth. This gear is made as large as will go through the opening in front, or about 6″ in diameter. Directly under this gear the box is pierced from the side. In this opening is inserted a long bush, through which a steel worm engages with the gear. An index plate secured to the outer end of bush, and an adjustable arm and index pin attached to the projecting end of the worm, completes the dividing mechanism. Substantial but delicate adjustments are provided for eliminating lost motion.

On the periphery of the case is turned a dovetail shoulder, which slides around in a corresponding groove in the quadrant-shaped base. The case is graduated on its edge, and may be clamped at any angle of elevation from 15° below a horizontal line to a vertical position, being equally stable in all positions. The face plate is no farther from the bed in one position than in another, and being seated to the case, and adapted to hold work directly on its face, forms a stiff and substantial device for cutting bevel gears and other work requiring angular motion. The tail center is also of a strong and substantial design.

An adjustable center rest of novel design also accompanies the outfit, and an extra bed or table, with straps for securing it to the table of the machine, is also furnished. With the centers arranged on this bed the line of centers may be set at any angle with the sliding table. A sufficient number of index plates are furnished to divide all numbers to 100, all even numbers to 200, besides other numbers incidental to this system of indexing.

A complete automatical spiral cutting outfit is also furnished when desired, which will evolve spirals of any conceivable pitch greater than one turn in four inches, the limit of length being about 10″. A heavy vise with steel faced jaws $7\frac{1}{2}$″ long by $1\frac{3}{4}$″ deep opening to $4\frac{1}{2}$″, is also furnished.

The machine is driven by a 3″ belt and has 4 changes of speed. It is powerfully back-geared in the worm and worm gear.

The weight of machine and attachments is about 2,800 pounds.

The countershaft, making 275 revolutions per minute, is driven with a $4\frac{1}{2}$″ belt, and being placed directly over the central position of cone shaft no trouble is experienced by the short movement of the cone and head.

A moving town, which can certainly be classed among the modern curiosities, actually exists in Manitoba. It is called "Boomtown," and can always be found at the terminus of the Canadian Pacific railroad. When the town is located, building lots are sold at fancy prices, and in a day or two the place contains all the evidences of a bustling, busy place, but with another advance of the construction party the old site is vacated as if by magic, and the lively scenes are transferred to another locality, which is given the same name, contains the same people, and the houses and tents are constructed of the same material that composed the former residences.—*Railroad Gazettee.*

It is proposed that the school of technology now in contemplation, and which is being promoted by the Board of Trade, of Paterson, N. J., shall embrace the following: 1. Practical plane and solid geometry. 2. Machine construction and drawing. 3. Building construction and architectural drawing. 4. Mathematics. 5. Magnetism and electricity. 6. Theoretical and applied mechanics. 7. Chemistry. 8. Steam and steam engines. 9. Weaving.

Condition of Trade.

A recent issue of the New York *Times* devotes over two pages to reports of the condition of business from 35 cities, centers of business in 25 States. The backward spring has done much to check trade which added to the devastations by floods in the West and South have depressed some portions of general business. These causes, however, are but temporary and the results must be likewise limited. Few manufacturers make complaints, dry goods and groceries having suffered most. It is stated that the labor troubles do not appear to have any extended effect. Collections are generally good, skilled labor finds ready employment and generally good wages are reported.

Test of a Vertical Tubular and a Water Tube Steam Boiler.

W. H. Odell, M. E., of Yonkers, N. Y., has recently made a test of the five Corliss vertical tubular boilers and the one Babcock & Wilcox water tube boiler at the Richard Borden Manufacturing Company's Mills, Fall River, Mass. We present a summary of the test as reported by Mr. Odell.

Each of these boilers is rated by the builders at 140 horse power, and with full damper they are doubtless capable of developing the rated power.

The trial was an ordinary every-day run, no care being taken to get a fancy result or record. The boilers were taken just as they are worked day after day without any specjal cleaning, etc., except that the coal burned, water evaporated, and ashes and refuse made, was ascertained for each 24 hours, rather than for runs of one week, the usual practice.

At the close of each day the fires on five out of the six boilers were burned as low as possible, the sixth being kept under steam in case of fires, etc. During the night the refuse was drawn from each furnace and fresh fires started in time to bring the steam up to working pressure at 6.30 A. M., at which time the engines were started and run until 6 P. M., with an intermission of one hour, between 12 M. and 1 P. M., each day except Saturdays, on which days the mills were shut down at 3 P. M.

Each morning at 8 o'clock, the water in all of the boilers was brought to a certain height, the condition of the fires noted, whatever coal may have been left over from the previous day weighed up and properly charged. The ashes made during the previous day were weighed dry, everything swept up neat and clean, and another day's trial commenced.

From the accompanying table it will be seen that the weights of coal burned, ashes and refuse made, and water evaporated, although charged against 10½ hours engine time, are the totals for 24 hours and include the fuel used in keeping up temperatures during the night.

The water fed to the boilers during the time the engines were running was taken from an open heater by a gang of three pumps, driven by the engines. The water was heated by a portion of the exhaust from the engines. The water level in the heater was kept about thirty inches above the delivery valves of the force pumps, and in the pipe connecting the heater with the force pumps a cup filled with oil was inserted. The temperature of this oil, as registered by a thermometer, is given as the temperature of the feed water, although this evidently is a higher temperature than that at which it entered the boilers, as the Babcock & Wilcox boiler, which was on the extreme end of the line and the farthest removed from the pumps, was some 150 feet from the point at which the temperature was taken.

A Freedman Injector of ample capacity was provided to supply the boilers with water, should any water be needed while the engines were stopped, but the precaution was always taken to fill the boilers well up toward stopping time, with water of a high temperature.

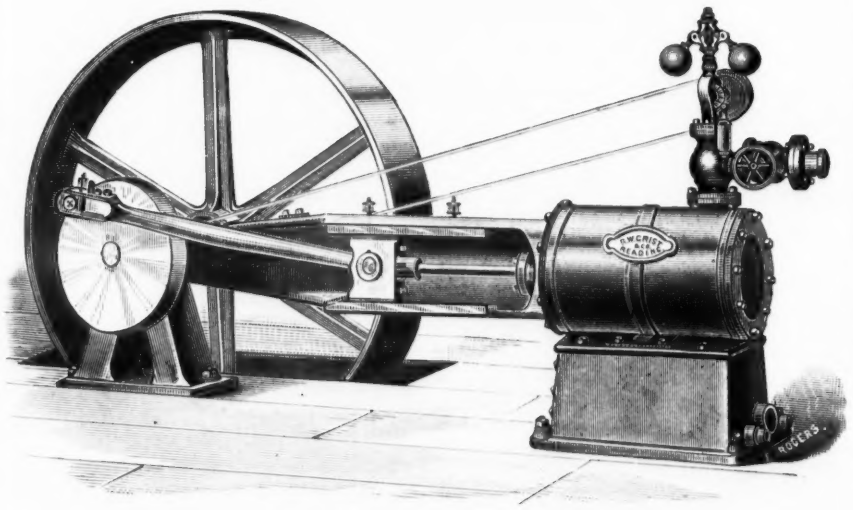
All the water that entered the boilers was passed through a 2″ Worthington meter, and then a portion was taken through a 1″ Worthington meter and credited to the Babcock & Wilcox boiler. The meters were specially for this test and arranged for feed water of a high temperature. They were tested by tank measurement as well as by weight, and the errors noted and corrections made.

Table Summarising Boiler Tests.

Date of trial.	May 9th, 1882.		May 10th, 1882.	
Name and number of boilers	1 B & W	5 Corliss	1 B & W	5 Corliss.
Running time of engines and boilers; hours	10½	10½	10½	10½
Average steam pressure; lbs.	76.3	76.3	81½	81½
Heating surface; sq. ft.	1,558	6,955	1,558	6,955
Grate surface " "	* 30	225	* 30	225
Ratio of heating to grate surface	51.9	21.2	51.9	21.2
Average temp. of feed water at pumps	204.8	204.8°	205	205
Lbs. No. 2 chestnut coal burned †	4,648	22,788	5,102	21,910
" ashes, clinkers, &c	796	3,925	826	3,672
" combustible	3,852	18,868	4,267	18,238
Per cent. ashes, clinkers, &c	17.12	17.22	16.18	17.21
Lbs. water evaporated from temperature of feed	39,988.26	175,155.70	45,538.47	170,822.81
" " " per lb coal	8.60	7.68	8.92	7.81
" " " " combustible	10.38	9.28	10.65	9.37
Equivalent eva'p per lb com'b from 212°	10.80	9.61	11.09	9.65
Lbs. coal burned per hour per sq. ft. grate surface	14.79	10.07	16.19	9.69
" " " " " " " heating	0.284	0.312	0.311	0.300
" water eva'p per hour per sq. ft. heating surf.	2.458	2.398	2.783	2.339
H. P. each boiler (30 lbs water eva'p per hr. = 1 H. P.)	126.9	111.2	144.5	108.4

* Reduced 25 per cent. from original surface by bricking off part.
† Includes fuel used keeping up temperature over night, or total for 24 hours.

GRIST'S VERTICAL ENGINE.



GRIST'S HORIZONTAL ENGINE.

A Horizontal and a Vertical Engine.

The accompanying engravings represent two forms of engine built by B. W. Grist & Co., Reading Pa.

The horizontal engine bed is of the girder type, with the cylinder bolted to the end and also to a base which forms the support for one end of the engine. This base is hollow, and is fitted with a coil pipe heater, by means of which the feed water is heated by the exhaust steam to about 170°.

The pillow block is secured to the other end of the frame by dowel bolts and keys, and has a broad base bearing on the foundation.

The vertical engine is self-contained, resting on a broad base to insure steadiness.

In both the horizontal and vertical engine the cross-head pin and piston rod are made of steel, and the cross heads are provided with gun metal slippers adjustable by means of wedges and set screws.

LETTERS FROM PRACTICAL MEN.

Preserving Memoranda.

Editor American Machinist:

Some months ago I described my method of preserving references in Dr. Todd's *Inder Rerum*. Correspondents have since written me, asking where the book can be purchased.

It was originally published by J. H. Butler, and later by Bridgman & Childs, of Northampton, Mass. Price, $2.00.

It can probably be obtained through any bookseller. If not it is easy to make one of any blank book of proper size—say "small 4to.", 300 pp.—giving two pages to each combination of a letter with one of the five vowels, and leaving a few pages at the end for appendix and memoranda.

If anything more substantial than the blank books found in stock is needed, any bookbinder can make one. A friend to whom my hint was of service, has sent me a beautifully made index in ledger binding, pages double column and lettered on moroco tags projecting from the edge, the tags secured by linen guards.

Where such a system is of frequent use, a set of box envelopes, with subjects marked on their ends, in which slips and memoranda may be placed for safe keeping, will be found also very valuable. They should be arranged in pigeon holes in alphabetical order for convenient reference.

Finally, in addition to these two handy methods of preserving professional information, I have a system of selection, classification and preservation of valuable pamphlets. They are kept properly filed and occasionally, are examined, the less valuable weeded out and those likely to be of permanent value are bound up in lots, each book so formed having an appropriate title as "Marine Engineering," "Water Works," "Pumping Engines," "Steam Boilers," "Materials and Metallurgy," "Technical Education."

Such a collection becomes, in time, the most precious part of a professional library.

R. H. THURSTON.

Stevens Institute, Hoboken, N. J.

Coarse and Fine Lathe Feeds.

Editor American Machinist:

I note in your last issue a correspondent advances a few ideas against coarse feed. Presuming that you admit of evidence on both sides of the question, I would like to say a few words on the subject also. Most machinists who are up with the times will agree with me, that on a lathe made a few years ago the coarsest feed is far too fine for the finest feed to-day.

Now, for example, take an eighteen or a twenty-four inch pulley. If you use a very fine feed for finishing, say, not over one-sixty-fourth, it will not chatter and will be smooth, but how many pulleys would you turn in one day? The price of pulleys would materially advance. Then take a feed from that up to five-thirty-seconds of an inch, and it will chatter the best you can do, but, if you pass by that point to three-eighth or one-half inch, it will stand steady and come out smooth, *if your tool is ground and set right for the business.* In one shop, where first-class work is turned out, there is a standard feed of not less than one-sixteenth of an inch, except on tool steel. You can go the other way as far as you please.

It used to be thought, and is to-day in some places, that eight or ten feet of two and nine-tenths shafting an hour was doing big things; but in a certain shop of high standing in Massachusetts they average thirty feet an hour on one lathe. The feed is eight inches a minute. This shafting is warranted round and straight every inch.

Not long ago I happened into a shop in the same State, and a workman was running a finishing cut over a steel bushing for a converted gun, which had to be about as true as a first-class job. The feed he was using was very nearly three-eighths of an inch, and the work was as smooth as a mirror (no washboard here). As for the Connecticut lathes that are so complicated, I think, with a good many others, that they are far superior to the old chain-and-rack feed lathe, that would at least give a man filing enough to do.

Hyde Park, Mass. F. N. ISHAM.

Vulcanized Fiber Triangles.

Editor American Machinist:

I have been using vulcanized fiber triangles for about two years and find them superior to steel, wood or rubber. Steel is too heavy and soils the paper, wood is apt to warp and twist, and rubber is easily broken. The fiber is as flexible as rubber, it is almost impossible to break it, and by giving it a coat of varnish it can easily be kept clean. W. F. K.

Tamaqua, Pa.

Brass Nuts—The Proper Metal for Bearings.

Editor American Machinist:

Chordal's remarks in his last article, about machine screws and nuts, lead me to rise and give my experience in that line. Several years ago I had occasion to repair some lathes and planers, and finding the cross screws and nuts badly worn replaced them with new ones. I made the screws of steel, as usual, but the nuts were of wrought iron *case hardened*.

After over seven years of constant use both the nuts and screws are in fair condition, but had the nuts been of brass both they and the screws would have been worn out long ago.

A soft nut will permit filings and dirt of all kinds to imbed itself into the inner surface, thereby making a lap which will rapidly destroy the screw.

Why will people persist in using babbitt metal for bearings in emery grinding machines when cast iron is so much better, besides being cheaper?

It must be for the same reason that led the man to put stones in one end of the bag and the grist in the other, instead of dividing it.

Du Bois, Pa. E. F. B.

Frictionless Packing for a Piston Rod.

Editor American Machinist:

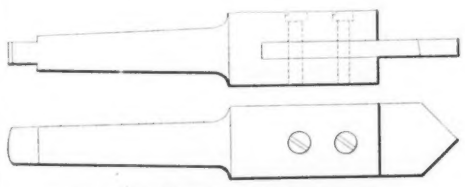
The usual way of packing the piston rod of a steam engine is to take any kind of packing a little larger than the stuffing box, cut it the right length for butt joints, then take a packing stick and hammer each ring in separately until the packing comes even with the edge of the stuffing box, and screw the gland up until the packing is shaped, as the engineers term it; then slack it off a few threads to let it expand. This is a very good way to make the engine thump every time she passes her centers, and to cause a great deal of friction, burn the packing, etc., as well as to give the engineer a great amount of work. It will also take a round sum out of his employer's pocket for extra fuel, packing, oil, etc.

I am running an engine of 200 horse power carrying 80 pounds of steam, and this is the way I pack my piston rod: I first clean all the old packing out of the stuffing box, then take packing just the size of the stuffing box and shove it in to break joints. I merely shove one ring against the other with a stick, using no hammer at all. When I have put the last ring in I take a string of lamp wick, twist and double it, and then wrap it tightly around the piston rod. This string should be long enough to go around the rod 5 or 6 times; then tie it fast, shove it against the packing with the gland and oil it well. Before so doing the nuts should be merely screwed up with the fingers against the packing, using no wrench at all. Now the steam will not come out between the piston rod and gland, but will rush out between the gland and the stuffing box. A temporary way to stop the steam from coming out here is to wrap a piece of cloth around the end of the gland, so as to prevent the steam from escaping at that point. It will be seen that by this mode of packing there is room between the unpressed rings to hold water condensed from the steam, which will hold the steam in check, and keep the packing moist and as frictionless as possible. Engineers may see that this packing should not be screwed up at all. If the steam should escape, remove the gland, take off the string and wrap it again until you get it right.

Before starting the engine in the morning the engineer should oil the piston rod, then move the engine backwards and forwards several times, oiling the rod each time; this will prevent the rod from tearing or injuring the packing when started up. With care this packing will last several years.

O. CLARK, Engineer.

Philadelphia, Pa.



Drill Press Shank with Counter-bore.

Handy Drill Press Shank with Counterbore.

Editor American Machinist:

I take the liberty to bring to your notice a handy drill press shank with counterbore and countersink. This tool is shown in the accompanying sketch. It is with a set of cutters of different shapes and sizes, a cheap tool to make, and may be used upon a great variety of work, besides being easily kept in repair. As will be seen it consists of a steel shank having two set screws to hold the cutters. The other features require no description. N. A. NEILSON.

Chicago, Ill.

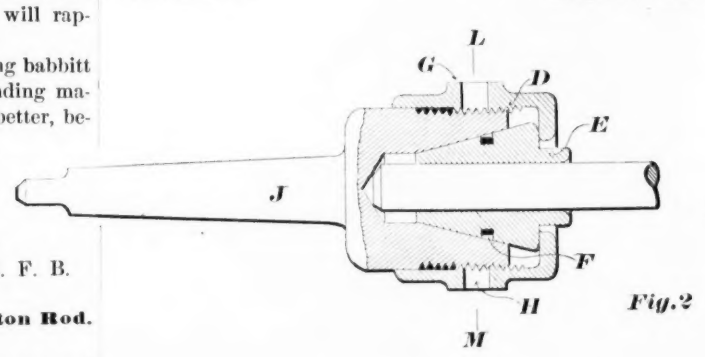
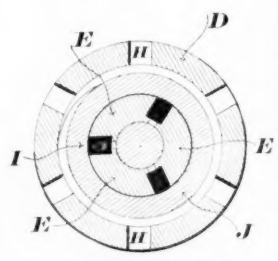


Fig. 2



Section L.M.

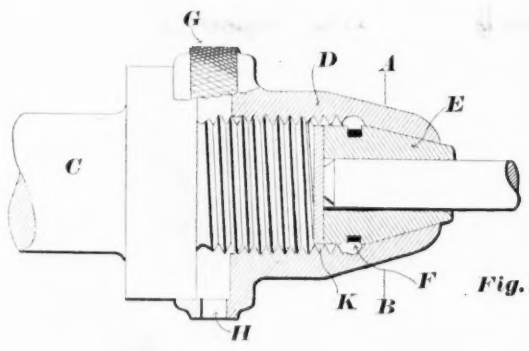
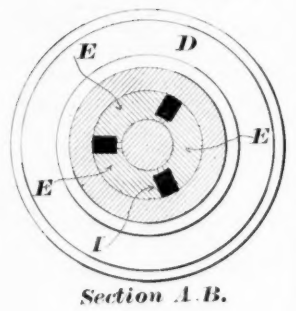


Fig. 1



Section A.B.

Home Made Drill Chucks.

Editor American Machinist:

Home made drill chucks, as usually found in the average machine shop, are "bores" for reasons not necessary to explain here. This is especially true of those things which have a hole drilled in the end and a set screw in the side to secure the drill. The sockets used for receiving taper-shank drills are good, but these drills are much more costly than those with straight shanks.

The qualities which drill chucks should possess may be stated as follows:

1. Drill chucks should be simple in their construction so they can be easily and cheaply made. This is the first thing the "practical man" generally looks for, and it is an excessive demand for this quality that often leads to anything but economy "in the long run," by the use of such things as above referred to.

2. Drill chucks should be so constructed as to hold the drill always concentric with the spindle of the lathe, or drill press, wherever they be used. As straight shank drills may be found in every machine shop, having all sizes of shanks, whether they be twist drills or the ordinary flat, home made drills, this valuable quality is not possessed by the chuck which secures the drill from one side by a set screw, or any similarly acting device, unless the shanks fill the hole—which is hardly ever the case. The writer has, in times past, found it most convenient and economical to use round steel for home-made drills, very near the size of drill wanted: flatten one end, leaving the point a little wider than the body.

3. Drill chucks should be easy and quick in their operations so as to consume the least possible time in setting and removing drills.

4. There should be no projections about the chuck, such as set screws, notches, or anything which would have a tendency to catch a man's clothes or "knock the bark off his fingers," just when he is engaged on a job which "is in a hurry," because this is just the time such phenomena generally take place, and is a time when it is least desirable to have a man stop for surgical operations or for oratorical exercises.

Figs. 1 and 2 of the accompanying drawings represent designs of drill chucks, which possess all the above qualities to a greater or less degree. The collet part *J*, Fig. 2, may be fitted to the spindle of a lathe or drill press. There are three jaws *E*, held in place by the shell nut *D*. It may be necessary to have more than one set of jaws, according to the range in the sizes of drills intended to be used. It is best to make these jaws of iron and case-harden them, as steel would be likely to spring more or less in hardening.

Pieces of soft rubber *I*, are placed between the jaws. These serve to open the jaws by their elasticity, when released by the nut *D*.

F is a rubber band, which serves to hold the jaws together when they are taken out to be replaced by a set with a larger or smaller hole. Springs may be substituted for the rubbers, but the latter are cheaper than the former. The nut *D* has six holes *H*, drilled into it, to receive a spanner-wrench in setting the larger-sized drills.

A knurled band, *G*, on the nut, will admit of it being set by hand when small drills are used. In the chuck shown in Fig. 1 the nut *D* is fitted directly to the lathe spindle *C*. The disc *K*, serves to cover the hole in the spindle to form a backing for the drill. Otherwise the drawings explain themselves.

C. A. SMITH.

Providence, R. I.

Practical Experience in the Oiling of Propeller Engines.

Editor American Machinist:

It is the old rule, and the most general rule, up to date, for marine engineers to do their principal oiling with the squirt can. It is true that most of our new steamships are provided with lamp-wick feeders, or patent drop-oil cups, but how many engineers depend upon the feeders? They fall back on the good old squirt can and use gallons of oil unnecessarily. If they would experiment a little, they would soon find that machinery can be made to run, after one good greasing, from two to three days, or more. To do this, if there is room, solder or braze a square cup on each outer edge or flange of the brasses; make the cup as large as possible—the more grease it holds the longer it will run—drill the oil hole not less than ⅜", and as much larger as the brass will allow. Don't cut an oil gutter along the top of the brass and spoil its most important bearing surface; cut two gutters leading from the oil holes diagonally towards the inside center edge of the brass, in the same direction in which the shaft revolves. Inside of these gutters two more can be cut parallel with the first, and the same on the bottom brass. These gutters will act as the thread of a screw and constantly retain the grease in the journal, keeping the center well supplied.

If the cups are attached to the brasses, the temperature of the brass will regulate the supply of grease. If the cup cannot be placed on the brass, lead it through the cap with as large a hole as possible, and through the center of the grease, resting on the journal, place as stout a rod, or wire, as will shake loosely in the oil hole.

Air pump, cross head and all journals that do not revolve, will need the cup in the center.

A crank pin, the most troublesome journal of all, can easily be made to run three or more days without refilling the cup. It will depend on the amount it holds. The tops must be tight to keep the grease from flying out.

The guides should be greased with a brush of convenient size, and, instead of squirting oil every 15 or 30 minutes, the brush will only be needed about once in two hours, unless the engineer can invent a self-acting brush. The grade of the grease will depend on the temperature of the engine room.

For link brasses, donkey pumps and all small journals it is better to use a softer grease. There is a grade in the market that remains about the same density at all temperatures, and with tight cups, will supply a journal for months.

If an engineer will follow these directions, when he arrives in port he will find that, instead of several pounds of waste, a little soap and water will soon make his engine as clean as the day he sailed, and after his journals have become thoroughly filled with grease, he will be surprised to see the difference in his oil and grease bill. If from habit and custom he cannot dispense with the squirt can, I should advise him to lock the can up in a closet and lose the key, otherwise he will never make the grease a success. The oil softens it too much.

What I have written above are facts attested by experience. I grease my engine (175 actual horse power) before leaving port, and do no more greasing or oiling—except upon the guides—during our run of 48 hours, and always find apparently as much grease in the cups as when we started. Sometimes one of the cups on the crank brass will be empty. The temperature of the brass will soon tell whether the grease will melt out. I have been five years without a hot journal—I might say not even a warm one. When I used oil, the journals required constant attention, and sometimes would get the best of me. AN ENGINEER.

1,807 South 12th St., Philadelphia.

Why Engines and Boilers Need Frequent Repairs.

Editor American Machinist:

In venturing a few remarks upon the subject of engines and boilers, I speak from experience, not from hearsay. The blame for so much destruction of life and property from boiler explosions may partly rest upon manufacturers as well as upon the individuals whom they employ to take charge of their engines and boilers. Consider for a moment the way steam users often purchase and manage their machinery. The party wishing to buy an engine goes to the builder who knows it is for his interest to make the motor appear as simple to the mind of the buyer as possible. "You can see for yourself," says the enterprising engine builder, "that it is not necessary to pay a man $2.50 to $4.00 a day to run that machine. Any man with common sense can run it, and for much less wages than are paid to other en-

gineers." The man buys the engine and goes home, thoroughly possessed of the idea that Tom, Dick or Harry can manage that engine. Next he starts off to look for boilers. He interviews the manufacturer of a sectional boiler, who lays claim to having the best steam generator in the market, because if it gives way with an inexperienced engineer it will not blow everything to pieces. Full well I remember making application for a situation to run an engine for a man who had been supplied with steam machinery on the above plan. I asked only a fair living price for my services.

This was his reply: "There was a time when people did not know enough to turn a four-wheeled carriage around in the streets of the city, but that time has passed. So it is with the engine people. They are getting more acquainted with things, and engincers have got to come down on their price." I did not make any reply but left the man to the bliss of his ignorance and went my way disgusted.

The last engine I had in charge was a 23" x 48" Harris-Corliss, fed with steam by ten tubular boilers and two Corliss boilers, the engine being located 130 feet from the nearest boiler. The help furnished me to run these boilers was of the greenest kind. As soon as one of these men got a little knowledge of firing he would not stay for 80c. or $1 a day. I tried to remonstrate with the Superintendent. The answer was: "I will hire and pay whom and what I see fit." This necessarily kept me a good part of my time looking after firemen, with the expectation of finding, at times, no steam, or worse still, finding the cylinders flooded with water. Any experienced hand well knows what mischief often comes from staying in the fire room to get well under way, then returning to the engine room to find the Superintendant there, mad as a hornet, because you were not there when wanted. I made up my mind it was best for the owners to run the engine themselves, so I quit. Thanks to my lucky stars I was not obliged to continue at the business for I am well able to take part in the machine shop work, building engines with better pay and no responsibility outside my own work. Since I have been in the shop, I have had a better chance to see the effects of carelessness and inefficiency in running engines, as evidenced by broken cranks, bent-up connecting rods, cross heads, cylinder heads split into pieces, etc. These little variations from good practice make work for engine builders and repair shops, but they bear rather heavily upon the owners, who might, if they chose, reflect upon the fact that most, if not all, of them could be avoided were careful men, at reasonable pay, employed to run the steam machinery.

A good engincer, with his well-trained ear, will instantly detect any unusual sound, if in hearing of his engine, and recognize at once whether it is caused by water in the cylinder or some other mischief, which, if allowed to continue, may end in the destruction of the engine. He will also look well after his boilers, especially if they be set in brick work, and he will know whether he is burning more coal than is necessary, and will work for his employer's interest, for a good engineer's reputation is at stake. E. D.

Somerville, Mass.

How to Obtain Good Foremen.

Editor American Machinist:

I am well pleased with your paper, especially with the letters from practical men, and would like to say a few words in reply to the article (May 20th) headed "Qualifications of a Good Foreman."

It is the general practice for parties wanting a foreman to state that they want an experienced one and Mr. Scott don't seem to be an exception. Now, I would ask where do these experienced foremen come from? Have they not all had to start at the beginning (inexperienced)? A successful foreman cannot leave his years of experience to his son or friend when he dies, and so a man must be dependent on that mighty power *influence*, or wealthy friends, to get him a start. Would it not be well for Mr. Scott, and employers generally, to recognize and encourage the talents and abilities of their own men and give such places to them as rewards for steady, faithful service? I have seen many cases in my 25 years' experience as a machinist where foremen have been obtained from some place afar off—with strong recommendations—who were far inferior in knowledge and skill to many of the shop hands, but they (the shop hands) were not "experienced foremen," so would stand no show of being put in the place. It is sometimes said that a stranger will have more authority over men than one with whom they have worked; but if a man has the right metal in him I believe he will command respect from those who have been his shop associates. In conclusion I will say that I am not an applicant for the place, neither do I want it, but if I can be the means of helping my fellow workmen who are deserving, I shall be satisfied.

GEORGE N. CROWE.

Mason City, Iowa.

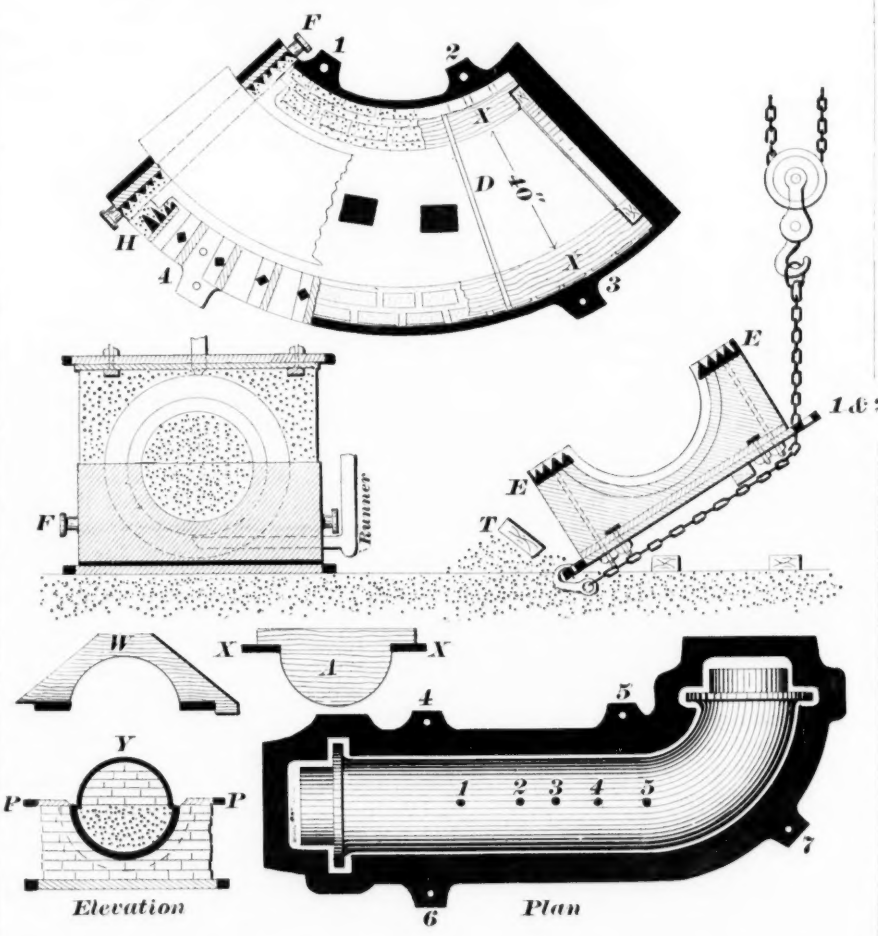
Two of the Pennsylvania railroad officials have sailed for Europe to examine electrical devices for switches, signals, etc., in use on English and continental railways. One of the agents of this road is employed to secure land for additional tracks between Philadelphia and New York.

Two Ways of Moulding Crooked Pipes in Loam.

BY THOS. D. WEST.

The adage, "There is nothing new under the sun," must have been written more for the consolation of those who never tried to find anything new, than for men who have spent years or a lifetime in bringing to light some principle or invention. Literally, the adage may be true enough; but, in any event, there is one thing a man should get credit for, and that is the improvements he makes on old tricks. The different ways there are of doing the same thing can only be accounted for by men's minds traveling through different channels to find them. There are all kinds of old tricks or plans for every existing occupation, and also for many that are to come into existence, and in this the moulder seems to have been provided for as well as other tradesmen. If he will only hunt for them, he will be astonished at the number stored up for him.

The cuts here shown represent the result of two moulders searching for a rigging to mould or sweep up crooked pipes in loam.



The moulding of these pipes shows the diversity of minds, and the different ways different men will adopt to do the same job, or the same class of work. Each plan here shown has its special advantage as well as its disadvantages, which the practical man can readily see. What would be an objectionable feature for this job might be a very acceptable one for some other job.

The upper cut shows the process of sweeping the bottom and top part of the pipe separately; also how the top or cope is rolled over, so as to be closed on the bottom part.

The lower cut illustrates a plan in which the cope was built so as to save rolling over, which for very large pipes is a point of considerable importance.

In moulding the upper pipe, there are some principles involved that Mr. Swift (whom the reader will remember) adopted, in order to have a good chance to finish the cope, and to save labor in the long run. The handles 1, 2 and 3 belong to the bottom plate. No. 4 is a section, showing a part of the cross bars that are bolted to the top plates, between which bricks are wedged, so that they cannot fall out when the cope is rolled over. *E, E.* show the end view of plates having prickers on. These plates, when bolted down, as shown, assist the holding in of the bricks under them, and the prickers can be daubed up with loam or a dry sand mixture to form the top joint. *H*, shows how the two end cross bars are made, having prickers cast on them to hold the sand that is rammed between them for forming the flanges and end joints.

For moulding or sweeping this pipe, a wooden frame *X, X*, having screwed to it the flanges as seen, is used. This frame is first blocked up level in the position wanted, and then as the brick work is built up, or the loam rubbed on, a sweep *D*, the front view of which is shown at *A*, is worked along on the frame *X, X*, so as to sweep up the mould.

In making this mould there were no core prints, or bearings at the ends, for the core to rest on. The mould ended on the outside of the flanges, and to form the face of the flanges and core prints there were half pricked plates used, as shown at *F* on the plan and end elevation. The trunnions cast on these plates made them easy to handle.

When the bottom part of mould was set down to be got ready to cast, one of these half plates was set up against each end of the flanges or mould, and wedged up until the half round hole in the two measured correctly to answer the purpose of a core print, and after the two chaplets were placed, the core was set in and the cope rolled over by using two cranes; one crane being hitched to the handles 3 and 4, and hoisted up as shown until it came on to the sand pile *T*, so as to prevent any sudden over-balancing. After this the second crane is hitched to the upper handles, 1 and 2, and the cope hoisted up clear from the ground. Then by hoisting upon the crane, as shown, the cope is completely turned over, after which one crane can handle it and place it wherever wanted.

After the cope is placed truly on top of the bottom part of the mould, in doing which there can be no trouble, as the top ends are all open so that the moulder can put in his hands and feel the two joints as well as see them, two upper end plates, which are not shown, are lowered over the ends of the core and pressed up against the face of the upper flange, being held there by props, clamps or bolts. The mould is then ready to be rammed up and got ready for casting; it being poured with two runners at the bottom, as shown.

The lower cut shows a plan in which there is less rigging used, at the expense of extra labor required to make the mould. In moulding this pipe, a frame was used, the same as described above, with the exception of core prints being fastened to the flanges. When the mould was swept up the core prints were also formed.

A, shows the sweep for forming the bottom part of the mould, and *W*, the sweep for forming the outside diameter over which the cope is built. The elevation shows the bottom half of the mould all ready for having the bricks built to form the cope. *P, P*, is the iron lifting plate, which, as seen in the plan, is one continuous plate entirely around the mould, being kept back from the ends of the core prints to allow plenty of room for the core when it is placed in the mould.

Y, shows a reliable way of forming a false mould or case for building the cope over. Sometimes the top, or false, mould is formed of all sand instead of as shown. After the brick work of the cope is completed, it is best to cover it over with a plate to protect the bricks. If necessary, this plate can be bolted down to the joint-lifting plate. When all is ready, the cope is hoisted off by 4, 5, 6 and 7, and the cope finished overhead. The false mould *Y*, and loose sand in the bottom is then all removed, and the bottom part of the mould finished.

The cores for both of these pipes were made in the ordinary manner; cast iron core arbors and plates being cast the shape of the pipes on which the cores were swept up with common core sand. When dried, the halves were pasted together for the lower casting, but for the upper one, the halves were not pasted together.

After the joints were rubbed together so as to make the core of the right diameter, the bottom half of the core was set in the mould, and the top half was set on, without using any paste whatever, thereby saving the labor of bolting the halves together, or using heavy straps to lift the core by.

The figures on the lower cut, 1, 2, 3, 4 and 5, show the position of the pouring gates. This casting was poured by having the iron drop on the top of the core, which, for thin castings, is better than having the casting poured from the bottom, in which case, by the time the iron fills up to the top, it is apt to be dull and cause the top of the casting to be cold shut.

About 14 per cent. of the hands employed in the shops of the Pennsylvania Railroad Company at Harrisburg have been discharged. The company is discharging the majority of the men along its whole line who were taken during the winter for extra work, but almost invariably confines the discharge to single men. The earnings of this road for March were $2,032 per mile, the largest ever reported for a single month.

The importance of our petroleum products may be seen in the fact that they stand fourth in the list of exports.

AMERICAN MACHINIST

PUBLISHED WEEKLY

BY

American Machinist Publishing Co.

HORACE B. MILLER, Prest.

JACKSON BAILEY, Vice-Prest.

LYCURGUS B. MOORE, Treas. and Sec'y.

96 Fulton Street, New York.

JACKSON BAILEY, Editor. HORACE B. MILLER, Business Manager.

LEWIS F. LYNE, F. F. HEMENWAY, } Mechanical Engineers.

The American News Company,

Publishers' Agents, New York.

The International News Company,

11 BOUVERIE STREET, (Fleet St.) LONDON, ENG.

Will receive subscriptions for the AMERICAN MACHINIST at 16/8 per annum, postage prepaid.

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NEW YORK, JUNE 10, 1882.

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The Relation of General Expenses to the Product in Manufacturing.

In manufacturing, as in other purely business affairs, the desired end is attained by bringing about definite results with the least expenditure of means. A man may build a house at an expenditure far beyond the requirements of furnishing a comfortable shelter, and it is sometimes quite as pleasant to invest money in manufacturing enterprises, beyond that required to serve the business end of making money. The important difference is that a house is not always built on business principles, while manufacturing is always and altogether business, and business in manufacturing is for the most part close competition. It does not answer to depend on skill and reputation, or on advantages in the way of quality of product, that may at the time be real enough, to take the place of the establishment of a correct business basis. Skill and excellence in one instance may be duplicated in another, and in the end success will follow where solid business principles lead. Not that mechanical ability will not always be an essential element in a manufacturing enterprise, but that it cannot succeed of itself alone.

Take the instance of the machine business for example, and there is a tendency towards large shops with more than an abundance of room, but, as has been time and again demonstrated, strict business consideration calls for something quite different, that is it calls for the close occupancy of all room that costs money to make or to maintain, to the end that the total cost of production shall come within certain commercial limits.

Assume – not of course as correct in all instances, but as a fair approximation in the more common branches of the machine business—that each thousand dollars invested should be represented by a workman, or in other words, by an individual *who produces something*, to offset the general outlay, or constant expenses, such as the interest on cost of plant, repairs, cost of power, heating, lighting and various well known incidental expenses: then consider that these various expenses are affected in but a slight degree by the value of the output, or the number of men employed, and it will be plain that in this respect there is a limit which must in all ordinary manufacturing business be kept inside of. That this limit reaches as far as the employing of more men in the room occupied than is in all respects pleasant, is at least partially demonstrated by the fact, that as a rule, the successful shops are those in which there is, in a certain sense, a lack of room for the business being done.

In a shop in which say, $50,000 capital is invested for buildings, tools, &c., if twenty-five men are employed, the items of general expense will perhaps use up all, or even more than all, the profits of their labor. Add to these twenty-five producers twenty-five others, and the profits of the business begin to appear. Stated another way; it may be considered, in such an enterprise, that a certain number of men must be constantly employed simply to pay general expenses, or to get ready to make money, while the profits, if any, will be measured by the number employed in addition to these. This is what renders it practically impossible to build up a paying business from the resulting profits, where a good deal of capital is invested in buildings only partially stocked with tools. The business management, under the existing conditions, may be the best possible, and the mechanical part may be correct, but the means and the end will never assume proper relations to each other, because the conditions are wrong.

There are many instances of machine shops running with just the ability to keep even in such times as these, (which means the certainty of running behind in ordinary or dull times) when, by the exercise of a little judgment in the expenditure of a comparatively insignificant sum, their capacity would be nearly or quite doubled. Unoccupied or sparsely occupied room in a machine shop is an expensive luxury, but, fortunately, that room may frequently be occupied by the addition of tools costing but a few hundred dollars.

Another point not always considered is, that increasing the capacity of a machine shop by the employment of more men, often has the effect to make the use of special tools profitable — by providing for their more nearly general use—that before the increase were of doubtful expediency; that is, in many machine shops there are special and expensive tools, almost or quite essential to successful competition, but which are used so little as to afford no profit.

From whatever standpoint the matter is looked at, the fixing of the proper relation of capital employed and the general expenses to the productive element, is one of the most important considerations in the establishment of a manufacturing business, and one, the overlooking of which, has probably caused the failure of more enterprises of that kind than any other single thing.

Literary Notes.

The transactions of the American Society of Mechanical Engineers relating to the meeting held at Altoona, Pa., August 10th, 11th and 12th, 1881, (over nine months ago), and those relating to the Annual Meeting held November 3d and 4th. 1881, (over six months ago), have just been issued by the secretary. The very gradual shortening of the delays incident to publications of the proceedings of the Annual Meeting, as compared with those of previous sessions gives some ground for the hope that the time is coming when the Society publications can be issued in the same year with the meetings reported by them. Only a slight examination, however, of the Transactions as printed is needed to disclose several typographical and other errors and omissions, that appear to evidence either carelessness or haste, notwithstanding the length of time required for their preparation.

The bound volume containing the entire transactions for 1880 (in paper covers) the first year of its existence, is also acknowledged. This volume is additional to the separate pamphlet reports of Transactions previously distributed, and is most creditable to the Society. We regret, however, to have to call attention here also to the fact that the report of Proceedings, and the seventeen other papers and addresses composing the volume, have been put together without regard to their proper sequence. As most of our readers know, Prof. John E. Sweet, in view of his eminent services in the Society's formation, was unanimously accorded the honor of reading the first paper presented before the society. His paper on "Friction as a Factor in Motive-Power Expenses," should have occupied a place in the volume accordingly, instead of being relegated to the middle of the book. Members who desire to permanently re-bind Vol. I. for library use, can, however, in a measure rectify the blunder by omitting the "Contents" page altogether, and inserting Prof. Sweet's paper where it belongs, namely, following President Thurston's inaugural address, which in turn should follow, instead of preceding, the lamented Holley's address at the preliminary meeting held February 16, 1880, nearly nine months before. This is not a matter of life and death, but it clearly is one of courtesy and fitness.

Aside from the papers presented, a large part of the report of proceedings of the two meetings is devoted to chronicling various efforts to amend the rules of the society. In this connection, the following extract from the remarks of Prof. Egleston, at Altoona, is exceedingly pertinent. He said:

"One of the greatest difficulties in starting any society is the temptation to occupy its time with a great deal of legislation. The whole country is burdened with legislation; it is the mania of the age. Many a young society has been stifled by its ponderous constitution and by-laws. If this society commences at this early stage with amendments to its constitution and by-laws—which are already good enough—the quicker the society gets through with it and goes to active work, the better. It is a great pity to have the time of those who are so occupied as most of the members of the society are, and who come here from a distance at a considerable sacrifice, taken up with the discussion of trivial matters."

The speaker might well have concluded his remarks upon the amendment then under discussion, by reminding the members—in view of the fact that it has hitherto required from six to twelve months to get a paper into print after it was read—that one of the probable results of an iron-bound rule, requiring all papers to be printed and distributed in pamphlet form, before being read, would be that most of the papers presented at the meetings of the society would be presented months after the author, in the stress of active business, had ceased to give attention to the subject under consideration.

The Secretary of the American Institute of Mining Engineers has recently sent out to members and to the press printed copies of the transactions of the Washington meeting, held last February. They embrace several valuable papers, one of which we reproduce in the present issue. A paper by H. E. Wrigley, C. E., considers the scope and probable productive limit of the Pennsylvania and New York oil fields. The conclusion is that the oil supply will not last many years at the rate it is now being drawn upon—twenty-five million barrels a year. Prof. Frazier, of the Lehigh University, makes some mathematical calculations in regard to chimney draught, some of the deductions being as follows:

It is evident from our discussion that it is a most wasteful form of heat engine, and that a certain supply of air can be furnished by a fan, or other blowing machine, with a smaller expenditure of heat than by a chimney. It may seem surprising, in view of these facts, that chimneys have not long since been superseded by a more perfect apparatus for producing currents of air. It must be borne in mind, however, that to realize the full economy incident on the substitution of a fan for a chimney it is necessary that all the heat be utilized which would otherwise escape through the chimney. The temperature of the products of combustion of the fuel must be reduced to that of the external atmosphere before they are allowed to escape, and the heat thus abstracted from them must be applied to some useful purpose. This is frequently impracticable. Owing to the disagreeable and deleterious nature of the gases issuing from furnaces it is frequently necessary that they be discharged at a considerable height above the surface, in order that they may be diluted with much pure air before coming into contact with animal or vegetable organisms. A chimney of some kind is, therefore, in general a necessity; and, since it is frequently impracticable to utilize completely the heat of the gases of combustion before they reach the chimney, it is plain that in such cases it is well to apply to the generation of a draught the heat which would otherwise be wasted. Add to this fact that a well-designed and well-constructed chimney requires, after being once put into operation, very little care or expense, continuing steadily and automatically to produce a draught, as long as the fire is properly tended, and it will be seen that its retention is in many cases justifiable on the score of economy.

Mr. William H. Hoffman, well known to readers of the AMERICAN MACHINIST, as possessing a fund of practical information regarding steam engines and boilers, is preparing to bring out a treatise on steam boilers, embodying data of experiments obtained by using, personally, the utmost diligence in preparing the apparatus and making the necessary calculations to intelligently record the true history of each experiment. The treatise, proper, will open with the subject of design as relating to steam boilers or generators. Proportions and details of construction will be treated at length, and the work will close with particulars about the erection and management of the apparatus. We are permitted to make the following brief extract from the introduction, and expect to be privileged to present a few chapters from the advance sheets while the work is in preparation.

"We have not made good use of those elements that form combustion that spring into leviathans of power, of motion, when they are treated as they should be. No, the truth is, we have stifled them, strangled them, condemned them for not yielding the full amount of heat due to theory, and then blindly turned our attention to inventing and applying some new cut-off gear for the steam cylinder of the motor hoping to make up all the loss

thereby. The grate bars, the boiler setting, the combustion chambers, the chimney, and, in fact, all things at the very root of heat energy have been left to take care of themselves.

"My attention has been called to over two hundred instances where manufacturing concerns in various parts of the Middle States were equipped with some of the latest improved steam engines, and these engines were drawing steam, or rather *steam and water together*, from boilers whose evaporative duty when *perfectly clean* was less than 6½ pounds of water per pound of combustible and the owners were, to all outward appearances, each of them satisfied that he had one of the most economical plants in the world. They would each calmly draw a check to pay a coal bill of double the amount that it should be and secretly chuckle at their good fortune."

The Philadelphia Trade Journal has undergone a complete transformation since its purchase, a few weeks ago, by James W. Nagle. It is now a lively enterprising weekly trade newspaper of eight pages. It is a good representative of Philadelphia manufacturing and business interests and should be strongly supported. The Subscription price is $1.00 a year.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(184) C. W. M., Bedford, Mass., asks: Is it possible for a pin-wheel to drive a toothed gear? *A.* If you mean by a pin-wheel, a trundle or lantern-wheel, yes.

(185) C. C. W., Oskaloosa, Iowa, asks: How can I temper brass springs? *A.* Brass is tempered by hammering, by rolling, or by subjecting to great pressure; hence the temper is already in the stock before it is made into springs.

(186) S. T. W., Baltimore, Md., asks for information as to the paint for machinery used by several well-known builders which he names. *A.* We are unacquainted with anything special in their processes. We know of nothing better for iron work than well boiled linseed oil, colored to suit the taste. It should be put on in three coats, the surface of the iron being thoroughly cleaned, and smooth.

(187) A. M. W., Waterbury, Conn., writes: We have a 4″ suction pipe running to the water in a well to which a large pump was connected The large pump is disconnected and a pump with a 2″ suction is connected, having altogether 60 feet of 4″ pipe. Will it take more or less power to operate the pump, using the 4″ suction than if the 2″ suction was continued to the water? *A.* Probably a little less, the friction in the larger pipe being less than in the smaller one.

(188) L. S., Newark; N. J., writes: I should like to ask you, or any of your readers, to tell me of a material that can be moulded in various forms, and that will answer the purpose of resisting heat better than fire brick. The material must be in a plastic state so as to be moulded to shape, and when dry must resist intense heat without cracking? *A.* Perhaps some of our readers may know what will serve your purpose. If so, we will gladly communicate their replies.

(189) J. B. M., Baltimore, Md., asks for a rule for calculating size and weight of a fly wheel for steam engine. *A.* There is no rule for determining the diameter of a fly wheel. The practice of some builders is to make the diameter equal to four times the stroke unless circumstances render it advisable to use one of different dimensions. For rule for calculating the weight of wheel, see "Weight of Fly Wheels," by William Johnson, in AMERICAN MACHINIST, May 13, 1882.

(190) H. C., New York, writes: I am turning paper rolls and find that on the four sides where the bolts were for compressing the paper (we have no hydraulic press) the paper tears out. What is the probable cause, and can you give me a remedy? *A.* The trouble is in the unequal compression of the stock. The fact that you turned the roll all right except in these spots indicates that there is no particular fault in the manner of turning. To make a good paper roll it is absolutely necessary that the compression should be entirely uniform.

(191) S. A., Capua, Italy, asks: 1. What is a good way to lay up a boiler that is not to be used for a considerable time? *A.* Fill the boiler with water above the top gage cock, and put in from two quarts to a gallon (according to size of boiler) of earth oil. Get up steam and blow off slowly with about ten pounds of steam. Remove the hand-hole covers while the boiler is yet warm, see that the inside is thoroughly dry and replace the covers. See that nothing is in contact with any part of the outside that will tend to keep it damp. 2. What is the most complete treatise on the steam engine indicator? *A.* We consider "A Treatise on the Richard's Steam Engine Indicator," by Charles T. Porter, the best. Although written with especial reference to the Richard's indicator, it is applicable to any form of indicator. 3. What is the best treatise on the manufacture of sheet brass and copper? *A.* We are unacquainted with such a work.

(192) W. F. R., Columbus, Ohio, asks: 1. Please give me a rule for determining the correct area of discharge and receiving valves for a 72″ air cylinder; piston speed 400 feet per minute; air pressure 4 or 5 pounds? *A.* There is a great diversity of practice in this respect, the tendency being at the present towards large valve area. We think good results are obtained by providing that the mean velocity of air through the receiving and discharge valves shall not exceed 30 and 40 feet per second, respectively. Applying this to the example given, the mean velocity of the piston being 6.66 feet per second, and the area of piston, 4071″, the area of the receiving valves would be, 30:6.66::4071:903 inches; and the area of discharge valves, 40:6.66::4071:678 inches. 2. Will the same rule apply to air compressors? *A.* Yes. 3. How would you counterbalance the engine? *A.* We can give no general rule for counterbalancing a steam engine. In some instances it is not necessary to counterbalance at all; while counterbalancing a vertical or an inclined engine usually calls for a different consideration of the subject, than the counterbalancing of a horizontal engine. It is almost entirely a question of judgment and experiment.

(193) C. J., Philadelphia, Pa., asks: 1. In two friction plates sliding the one on the other and kept together by moderate pressure, one plate being covered with leather and the other a plain cast iron surface, in which case will there be the most friction—with the cast iron surface polished or made reasonably smooth without polishing? *A.* There will be a little more friction with the surface unpolished, but the leather will wear out more rapidly. 2. If I should cover both plates with leather would it wear as well as with one iron surface? *A.* No. 3. In two systems of levers, No. 1 being a plain right angle or bell-crank lever with each arm 12″ long, the power, a 10 pound weight, being applied at the end of one arm, the resistance being at the end of the other arm, and No. 2 a vertical lever, the resistance being at the lower end, and the distance from this end to the fulcrum being 12″. The lever extends above this fulcrum 5½″, from which point a link extends horizontally 12″, at which point a weight (10 pounds) moving between vertical guides, is attached. What I want to know is which is the most powerful lever of the two? *A.* In No. 1 the motion of the weight and the point of resistance is the same, while in No. 2 the motion of the weight, through a limited distance, is much greater than that of the point of resistance, hence No. 2 is much the more powerful lever.

(194) F. L. W., Westfield, Mass., writes: An engine is running 126 revolutions, belting on line shaft from a 32″ pulley, line shaft running 340 revolutions. The line shaft drives a plating machine at 1,050 revolutions, a No. 3 Sturtevant blower 3,000 revolutions, and a buffing lathe making 3,000 revolutions. I want to ask: 1. What power does it take to drive this machinery? *A.* It would be impossible to tell without making an examination. 2. Would it take less power to run line shaft 150 revolutions, getting speed by using larger pulleys? *A.* That will depend on length and diameter of shaft. If the shaft is properly proportioned the speed is not too high for the class of machinery named. Without knowing more of the matter than given in your communication, we should question the propriety of reducing the revolutions of line shaft, although the small pulley to which your belt from engine is decidedly objectionable. 3. How many gallons of water per horse power per hour should an engine use? *A.* It will depend on the construction size and management of the engine. Some engines require as little as 2 and others as much as 10 gallons. 4. Does it require more power to run a line shaft 340 than it does 150 revolutions? *A.* Yes.

(195) C. E. M., Leadville, Col., writes: We have an Acme pump pumping hot water, which is almost useless from the water ports being nearly stopped by lime; the ports are too crooked to use a chisel. Is there anything that will remove the scale? *A.* Draw off the water, plug up the lower end of the ports and fill them with crude petroleum or kerosene oil. Let it stand over night and in the morning the scale will be found loosened so as to be easily removed.

(196) J. E. M., Wellmar, Minn. Your method of turning a groove in the rolls of a Dudgeon tube expander 1-16″ in depth and 9-16″ wide, leaving a collar with rounded edges at each end, for expanding tubes and forming a bead both inside and outside the tube sheet, is quite an old idea.

(197) J. W. S., Pana, Ill., asks: Can you tell why it is the customary practice in American locomotive building to place the centers of driving boxes from 1½″ to 3″ below the cylinder center. I have read pretty extensively but have never yet seen any authority which definitely attempts to defend the practice. When inclined cylinders were used it was usual to have their centers about coincident or with but slight variations, and with generally good results; it is also considered desirable in stationary and marine practice to have them in line. Of course the springs under a locomotive give some chance for vertical difference, but under a Baldwin on the roughest roads the drive box center is lower than the piston. Will you kindly refer us to authority or tell us why this practice has been adopted by the foremost builders of the world, and oblige? *A.* The centers of the driving wheels should coincide with a line drawn through the center of the cylinders. The custom of locomotive builders is to set the driving boxes low to allow for the springs assuming a permanent set as they certainly will, besides the wear of the driving brasses tend to lower the engine upon the wheels, which brings the centers of the wheels higher in relation to the center line of the cylinders. Stationary engine builders usually set the engine shaft high to allow for the wearing down of the pillow block. Any extreme in this matter is sure to introduce errors in the working of the engine.

(198) N., Chicago, asks: 1. If I have published a new invention in the AMERICAN MACHINIST, does that prevent me afterwards from obtaining a patent, if the object in question was original with me? *A.* If the article illustrated is patentable you may apply and secure a patent at any time within two years from the date of its publication. 2. Is it advisable for a boy to enter the machinist trade who is not adapted for mathematics but in every other way is intelligent? *A.* No, but a man or boy may become a first-class practical workman who knows nothing about mathematics beyond the figures upon a two-foot rule. Many workmen of this kind can be found in the machine shops in all parts of this country. 3. Is any man gifted with foresight, I mean able to judge near the mark, about times and things in the near future? *A.* None claim to be reliable except the *clairvoyant* and *spiritualist* and experience has proven that their judgment is far from being infallible. There are men who carefully watch events as they occur and taking those events as causes, from them predict certain effects, but frequently the effects looked for do not take place, although in many cases their judgment has been found correct. As an example of this kind we may mention the signal service of the U.S., and their weather prognostigations, which are based upon the theory of cause and effect.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

We receive numerous inquiries relating specially to matters of private interest. While desirous to oblige our friends, we would suggest, that an advertisement of two or three lines under this heading will usually develop the desired information easily and quickly.

Portable Forges, $10. Holt M'fg Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

James W. See, Consulting Engineer, Hamilton, O.

Presses and Dies. Ayar Mach. Works, Salem, N. J.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

J. C. Hoadley, Engineer and Expert, 29 High St., cor. Federal, Boston, Mass.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Do you manufacture Hardware or House furnishing goods you wish sold in New York? If so, address Manufacturer's Agent, care of AM. MACHINIST.

Machinists' Bench Tools; largest stock in the United States. Send for Machinist Catalogue, 212 pages. Tallman & McFadden, 607 Market st., Philadelphia.

We want to buy a Gear Dressing Machine, either new or good second hand. Address, with full description and price. Great Western Manufacturing Co., Leavenworth, Kansas.

J. W. Penfield, Willoughby, Ohio, writes to T. New, 32 John street, N. Y.: We are well pleased with the Prepared Roofing; will want more of it before long.

"How to Keep Boilers Clean," and other useful information for steam users and engineers. Book sent free by the publisher, Jas. F. Hotchkiss, 84 John Street, New York. Mention this paper.

"Slide Valve Gears," by Hugo Bilgram, published by E. Claxton & Co., Phila., describes the easiest method known for correctly proportioning slide valves, link-motions and cut off gears; price, $1.00.

Russell & Struthers, Wax Process for making outline engravings. Specimens each week in the AMERICAN MACHINIST. We also do Map Engraving with best facilities. Russell & Struthers, 59 Park Place, New York.

Steam Economy, by A. Wilkinson, M. E., No. 123 N. 4th street, Philadelphia, Pa. A new work on steam. Illustrated with numerous diagrams taken from engines in this country and in England. Points out and remedies defects in steam engines. Great variety of practical information for steam users. 124 pp., in cloth, $1.00 by mail.

If you desire to keep pace with the daily progress and development of Telephone, Telegraph and Electrical matters, have a copy of the NEW YORK REVIEW OF THE TELEGRAPH AND TELEPHONE sent to your address. Only $2.00 per annum. George Worthington, Editor and Proprietor, No. 23 Park Row, New York. P. O. Box 3329.

"Sibley College of Mechanic Arts, Cornell University.—Entrance examinations will be held June 12th and September 11th, 1882. For the register and catalogue just issued, containing reorganized courses of instruction, scientific and practical, including draughting, machine construction, general shop work, etc., apply to the President of Cornell University, Ithaca, N. Y."

Bound Volumes and Patent Binders. We can furnish Volume 3 of the AMERICAN MACHINIST, containing the full 52 issues of 1880, or Volume 4, containing the 53 issues of 1881, neatly bound in cloth, ready to ship by express, for four dollars. Either volume unbound, three dollars. "Patent Binder" for the AMERICAN MACHINIST holds 53 weekly issues in good shape. Sent to any address by mail for one dollar. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton Street, New York.

"Extracts from Chordal's Letters," the most interesting mechanical book published. A great variety of mechanical and business topics treated in a wise and witty way that will be instructive to old and young mechanics, and interesting to everybody. As many as 150 copies have been sold in a single shop. Over 40 Humorous illustrations; 320 pages, 12 mo. Price, $1.50 per copy, by mail, to any address. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton St., New York.

Important to Millwrights, Machinists and Pattern Makers—I have compiled a complete and absolutely correct table of The Diameters of Toothed Wheels on Pitch Line, by which any mechanic can instantly find what he requires or wants, without calculating. This table should be in the chest of every mechanic and millowner, and in the office of every manufacturer, as it saves hours of time, and dollars of money. No algebra to learn, no arithmetic to study. I have also added the computation table of what is known as the "Manchester Principle." Price, $2 per copy. Address, Wm. T. Ross, care Bremaker & Moore Paper Co., Louisville, Ky.

MANUFACTURES.

Metz & Heinlen has started a new shop for general machine work at Burlington, Iowa.

Aurora, Ills., Steam Engine Works, Colby Bros. & Co., is a new concern just started. The works cover 1½ acres.

The Straight Line Engine Company, Syracuse, N. Y., have just completed and shipped a 10″ x 16″ engine to Thomasville (Ga.) Oil Company.

James Sampson & Co., of Windsor, Vt., intend locating their business of manufacturing cotton-mill machinery, at North Adams, Mass.

Totten & Co., of Pittsburgh, Pa., have successfully turned the 24-foot pulley, 38-inch face, recently cast by them, weighing 60,000 pounds.

The Murray Iron Works, of Dubuque, are building a new foundry at Sefflers Station, Iowa, also are building an extension to their machine shop.

Grant & Bogert, Flushing, L. I., have just booked orders for 12 lathes for the Norfolk & Western Railroad, to be placed in their shops at Roanoke.

S. T. Lund, in the machinery business at 71 Oliver Street, Boston, has connected himself with Messrs. Kelly & Ludwig, of Philadelphia, for a term of years.

J. M. Carpenter, manufacturer of taps and dies, Pawtucket, R. I., has begun the erection of his new machine shop, which will be 40 x 112 feet and three stories in height.

The Hawkeye Steam Boiler & Sheet Iron Works, Des Moines, Iowa, are a recently established concern, and are doing a nice business. Their works are 100x44 feet.—*Industrial World.*

B. W. Grist & Co., Limited, Reading, Pa., write us: "The demand for our horizontal and vertical steam engines is increasing, and to keep up with orders new and improved machinery has recently been added to our works."

J. E. Lonergan & Co., 241 & 243 Arch Street, Philadelphia, manufacturers of patent oilers and lubricators for steam machinery, write us: We are now worked to our full capacity to keep up with orders. We are enlarging our works, and our capacity will be more than doubled by the first of October, or January, 1883, at latest.

William Coutie & Son, Troy, N. Y., are building an extension to their machine shop, a part of which will be used as a room in which to erect their compound engines, the building of which has for sometime constituted the principal part of their work. They have a liberal number of orders booked, and continue to get considerable work done in other shops to expedite the filling of their orders.

The Packham Crimper Company, Mechanicsburgh, Ohio, have moved into a new shop and already find the capacity inadequate to supply the increasing orders for tinman's tools, especially the Packham pipe crimping machine. They have put in a No. 3 Brainard universal milling machine with automatic spiral attachment, besides a number of special tools made on the premises. They are now getting out some new tinman's tools and are making arrangements to build a light shear and punch.

C. H. Delamater & Co., New York, are building the machinery for auxiliary power for a number of sailing vessels, their previous success in this direction having brought them orders with prospects of a good deal of business in this direction. They are also busy building large air compressors, and are doing an increasing business in the Ericsson caloric pump besides their regular steamship and steamboat business.

William Tolhurst, Troy, N. Y., is occupying his new machine shop on the corner of Sixth and Fulton Streets, in the manufacture of laundry and experimental machinery, shafting pulleys and hangers, &c. He has added a number of new tools amongst which are some from Gould and Eberhardt, and from other manufacturers. The motive power in the new shop is a high speed (200 revolutions) engine from Hewes & Phillips, of Newark, which is giving satisfaction to the owner, and doing credit to the builders by its running.

Knowlson & Kelly, Troy, N. Y., are in a fair way of establishing considerable business in building compound propeller engines. They have recently engined a passenger boat for George Marks, of Troy, which is to run between Baltimore and Philadelphia, and are building the engines for another boat for the same party. The boat which they have just engined has a surface condenser with independent circulating pump, and direct-acting steam pump of their own manufacture. They have just completed another "pony" locomotive for the Bessemer steel works of Troy.

Machinists' and Engineers' Supplies.

NEW YORK, May 25, 1882.

Business during the week in the supply line has been fair during the week but cannot be considered active. The feeling continues unsettled and dealers, in buying, are disposed to retain their conservative disposition. Prices nominally unchanged.

The general condition of Pig Iron market unchanged.

We quote: Foundry No. 1 at $25 to $25.50; Foundry No. 2 X, $23.50 to $24; Grey Forge $21 to $22.50. Foreign Iron dull, with no material change in prices. Copper dull at 18⅜c. for Lake Superior. Other metals unchanged. Spelter 5¼c. to 5¾c.; Tin Banka, 28c.; Straits and Malacca, 21⅜c. to 22c.; Billiton and Australian, 22c.; Antimony, 11⅞c. to 14c. according to hand.

WANTED

"Situation and Help" Advertisements, 30 cents a line, each insertion. About seven words make a line. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

Wanted—Five good moulders and five good core makers. Address, Holyoke Machine Co., Holyoke, Mass.

Pattern Maker.—Situation wanted in West or South. Used to all kinds of work. References given. Address G. R., office AMERICAN MACHINIST.

An engineer wishes an engagement with a firm which manufactures marine work. Address Box 8, care AMERICAN MACHINIST.

Wanted—Two first class machinists for general work; experienced men on shafting, pulleys, rolls, etc., preferred. Address this paper. Box 9.

Wanted—An agent to sell a first-class steam engine; must be competent to advise customers on engineering questions. Address, R., office AMERICAN MACHINIST.

Wanted—An experienced moulder, familiar with pipe work, to operate an Iron Foundry in Newark, N. J. A good chance for the right man. Address Henry W. Bulkley, 149 Broadway, New York.

Job Wanted in New York or vicinity, by a first-class machine pattern maker, accustomed to pump and engine work. Address Pattern Maker, South End P. O., Holyoke, Mass.

Wanted—Situation in charge of either large or small shop, in city or country, by an experienced machinist. Best of reference. Address, Box 7, office AMERICAN MACHINIST.

Situation wanted by a Machine Shop Foreman; a general mechanic and practical machinist. Good reference and experience. Address D. H., Box 1936 Muskegon, Mich.

Wanted—A metal spinner. To the right man, permanent employment and good wages. Address, with references, Empire State Manufacturing Co., Buffalo, New York.

Wanted—Scraper hand with first-class experience on "ways" of lathes, planers, &c. If planer hand or contractor for tool fitting, so much the better. Address with particulars, Chicago, care of AMERICAN MACHINIST.

Wanted.—An experienced traveling man in the Injector business. One who thoroughly understands the trade, both practically and as a salesman. Give references and salary expected. Address, A. B., care AMERICAN MACHINIST

Wanted A Party with good mechanical knowledge, of pleasant address and competent for salesman of machinery. With the proper party a liberal arrangement will be made. Address, at office AMERICAN MACHINIST, Burton, stating with what special machinery applicant is most familiar.

Wanted—A thoroughly competent Foreman Machinist; must understand building iron tools, and wood working machinery and mill furnishings, and be capable of handling men and work; must have first-class references. Apply, stating experience, salary expected, &c., Morrison Bros., "Soho Machine Works," Toronto, Canada.

A man 31 years of age desires a situation in a machine shop as superintendent or foreman. 13 years' experience as apprentice, journeyman, toolmaker, draughtsman and foreman in Illinois, Iowa, Minnesota, Nebraska, Kansas and Missouri. Correspondence invited from parties who mean business. J. E. McConnell, Iowa City, Iowa.

For Sale—A 60 lb. Bradley Cushioned Hammer, entirely new and perfect, at a bargain. Address Lock Box 160, East Hampton, Conn.

Wanted—To purchase a Hewes & Philips Gear Cutter—second hand. Address, giving price and other particulars, Campbell, P. O. Box 2101, New York.

For Sale—An I. P. Morris Engine, sixteen (16″) by thirty-six inches (36″) cylinder, with governor. Also a fly wheel fourteen feet (14′) diameter and twenty inches (20″) face. Can be seen at works of Wm. Sellers & Co., Philadelphia.

BRADLEY'S CUSHIONED HAMMER
BRADLEY & COMPANY SYRACUSE N.Y.

The Second Grand Exhibition Fair
OF THE
New England Manufacturers' and Mechanics' Institute
Will be held in THEIR MAMMOTH EXHIBITION BUILDING, (the Largest in the United States),
In Boston during the months of September & October, 1882.

Affording the best opportunity for advertising, or of introducing to the public new inventions. Artists, Inventors, Producers, Mechanics and Manufacturers, from every nation, invited to contribute. The product of New England's hand and brain will be well represented. No charge for space. Blank forms for application to exhibit furnished free, upon application to

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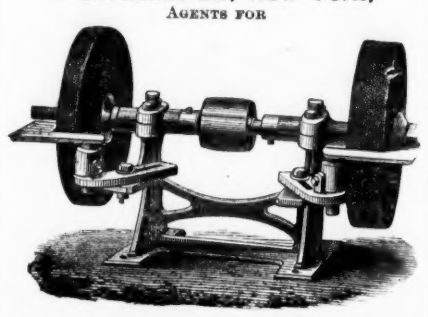

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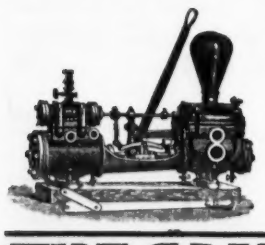

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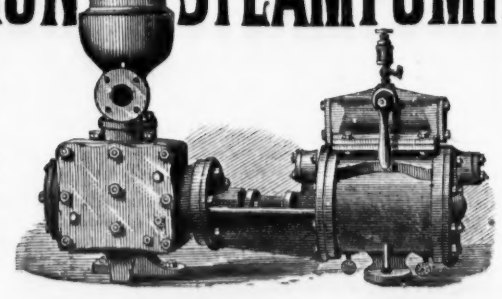

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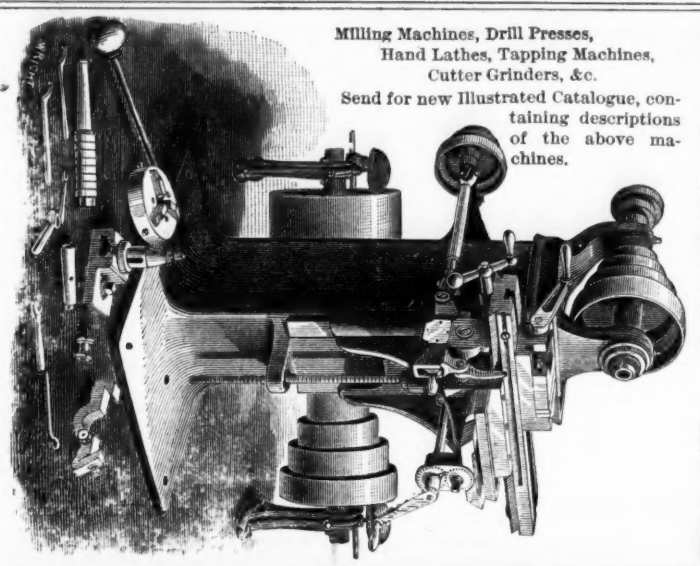

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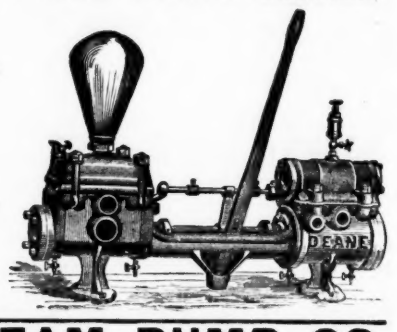

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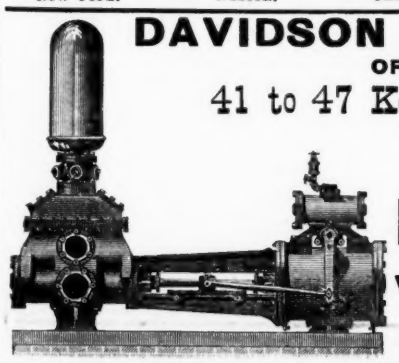

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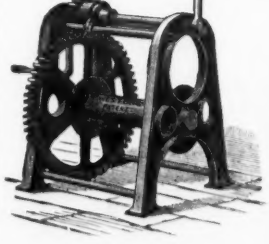

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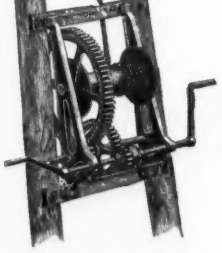

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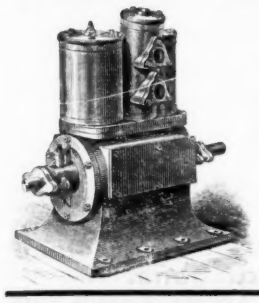

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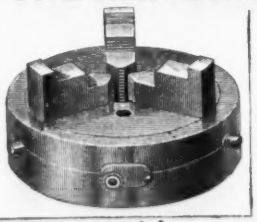

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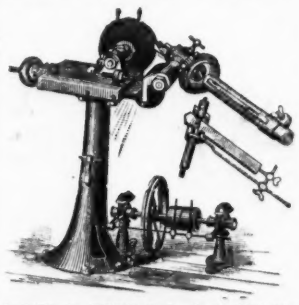

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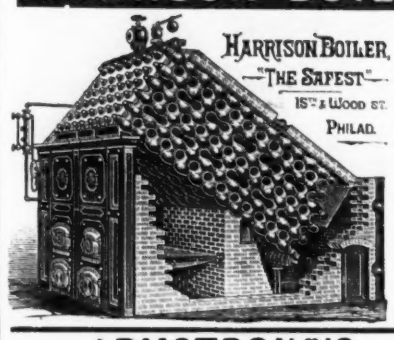

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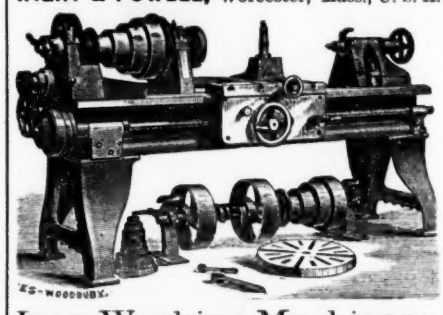

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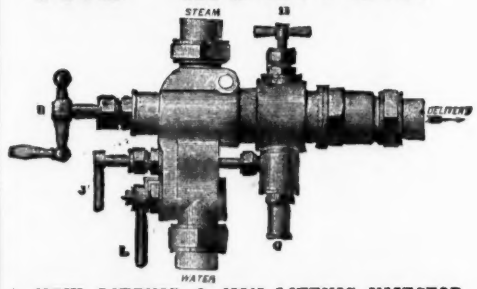

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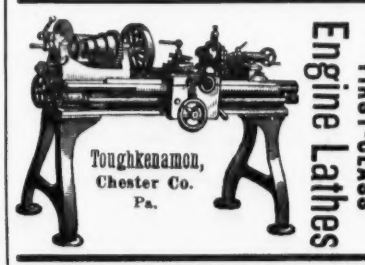

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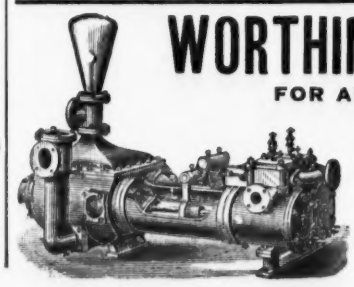

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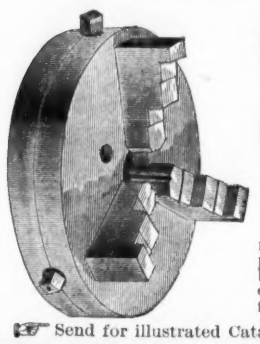

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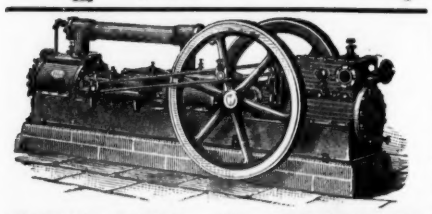

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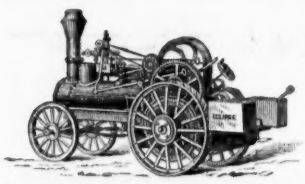

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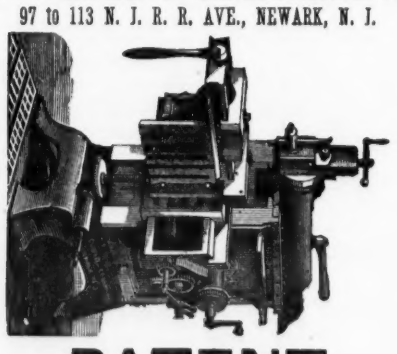

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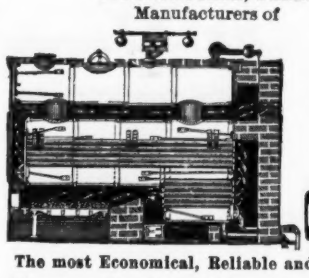

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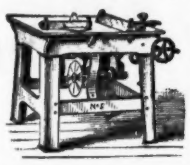

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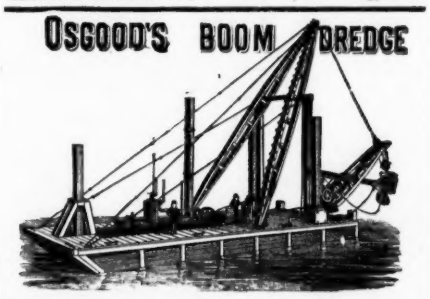

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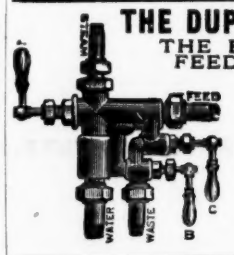

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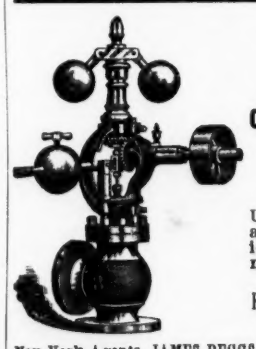

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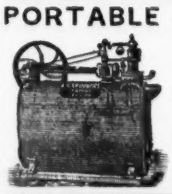

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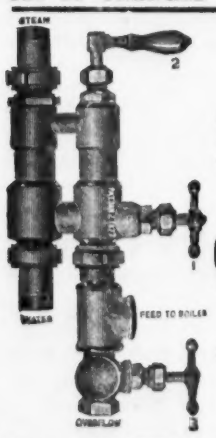

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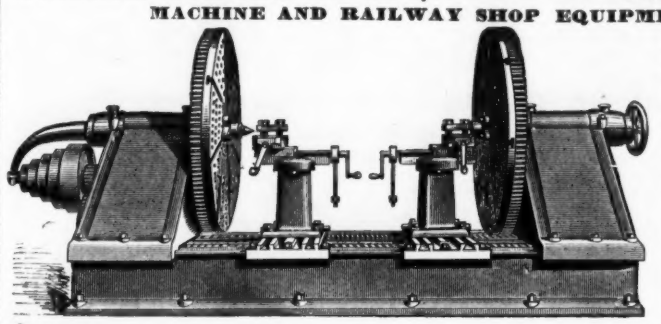

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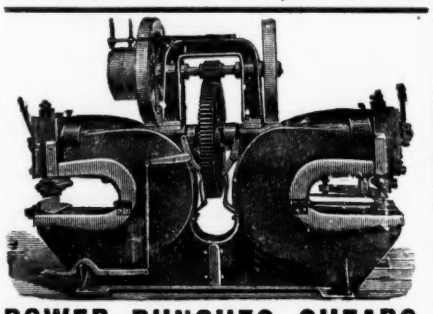

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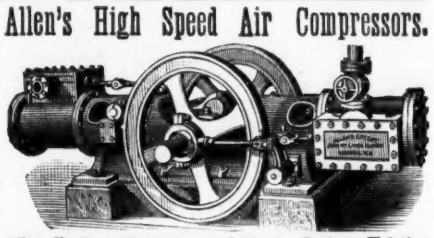

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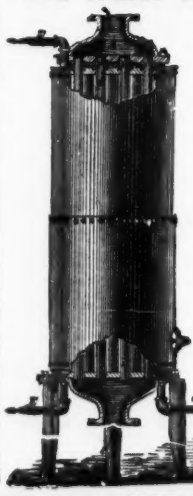

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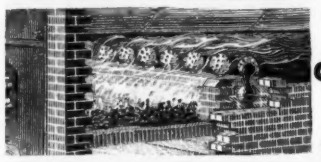

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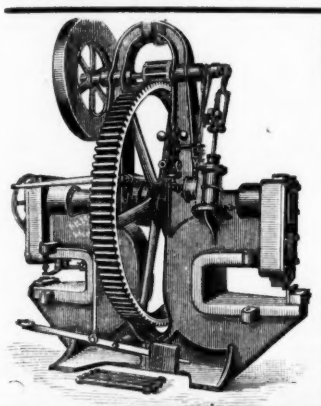

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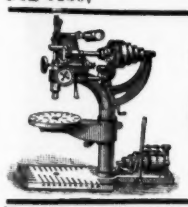

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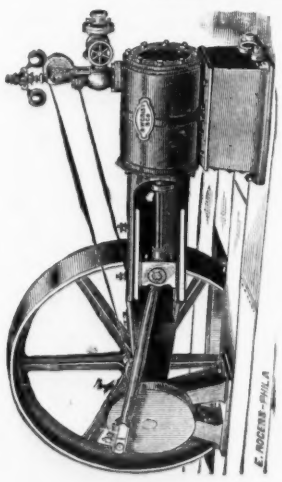

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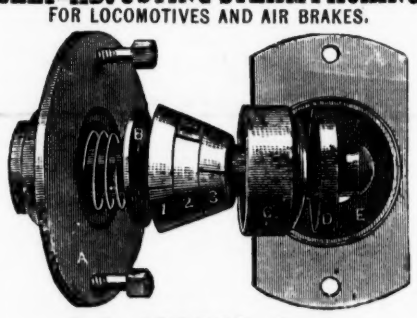

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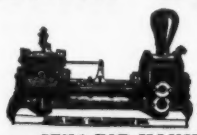

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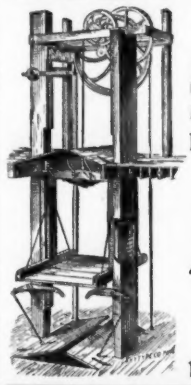

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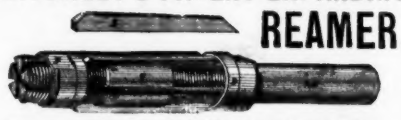

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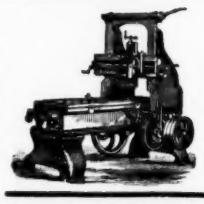

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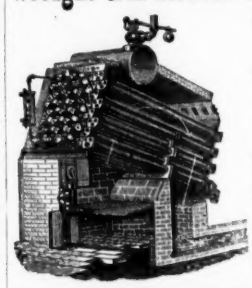

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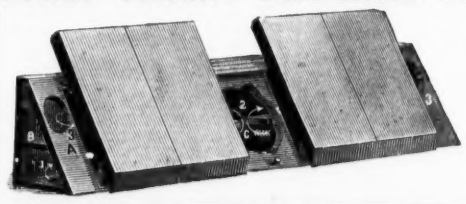

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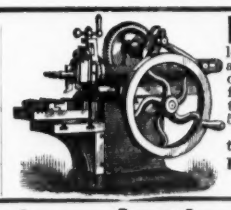

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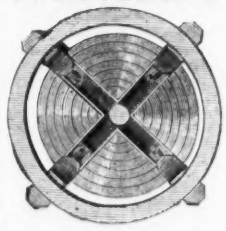

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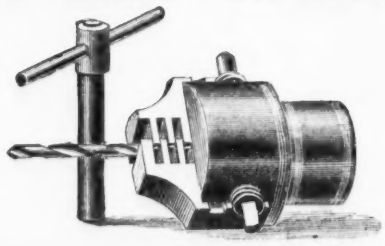

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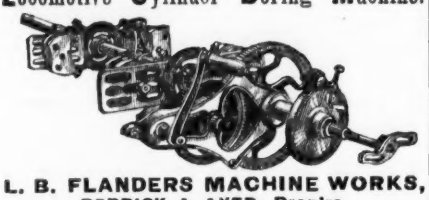

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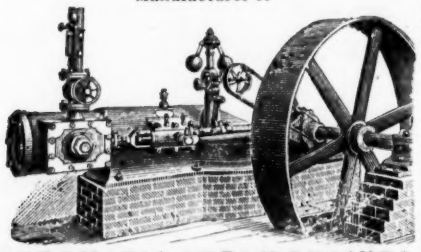

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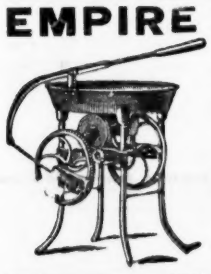

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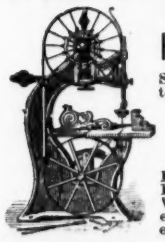

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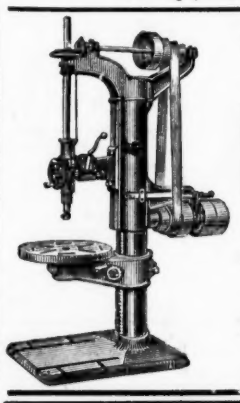

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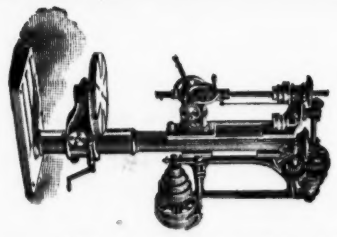

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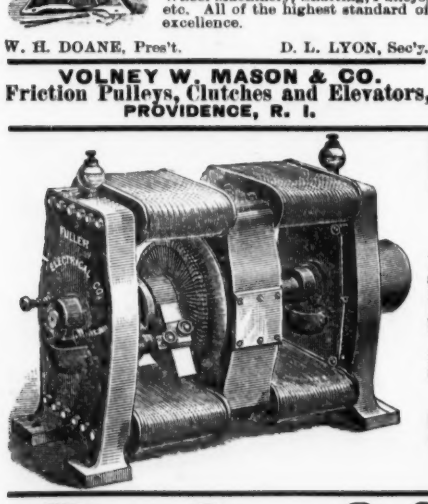

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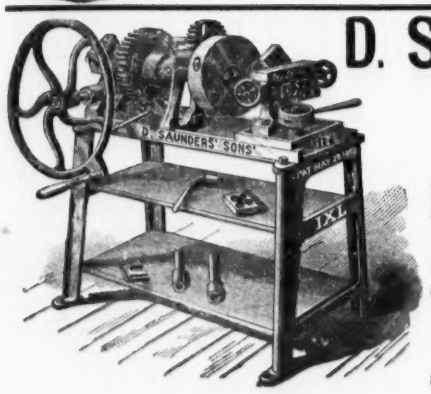

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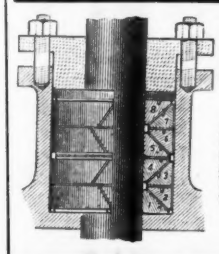

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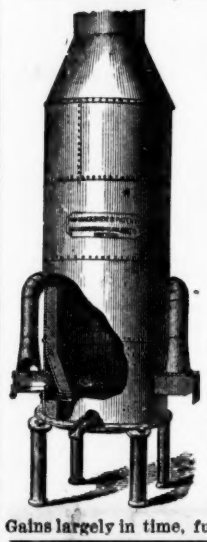

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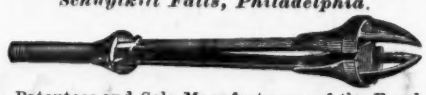

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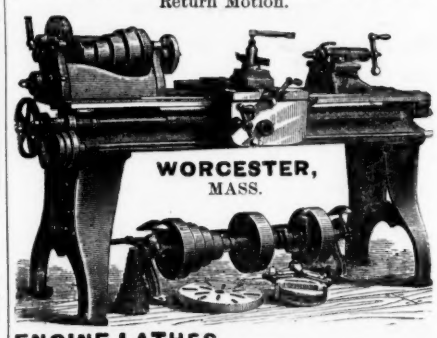

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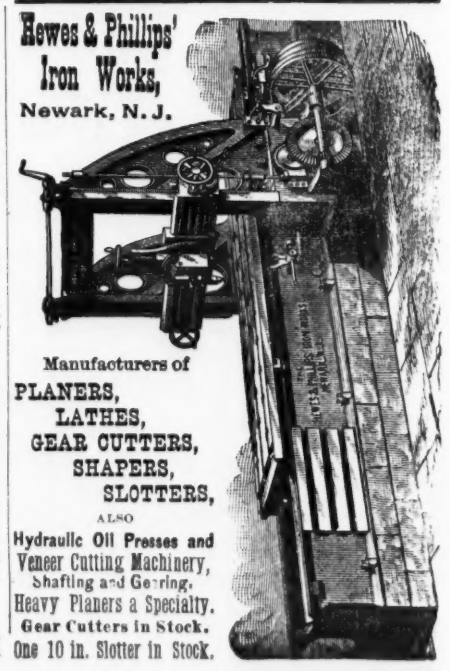

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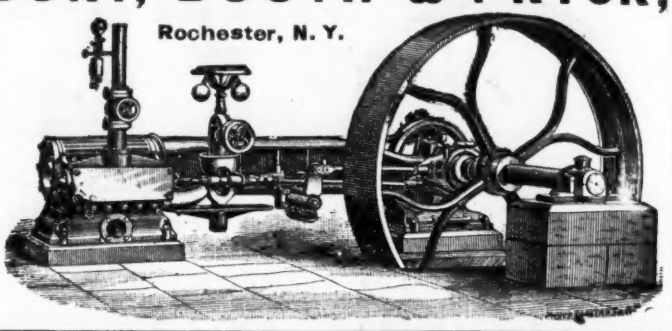

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17 " "	6 "		Johnson.
16 " "	6 "		Fitchburg.
16 " "	10 "		Blair.
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1 " " 26 in. x 12 ft. Lathe & Morse. "
1 Plain Engine Lathe, 15 in. x 4 ft. "
1 Engine Lathe, 30 in. x 16 ft. Perkins. "
1 " " 16 in. x 6 ft. " "
1 " " 24 in. x 12 ft. Michel. "
1 " " 12 in. x 5 ft. Prentiss. "
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1 Fox " 25 in. x 5 ft. Pike & Dean. "
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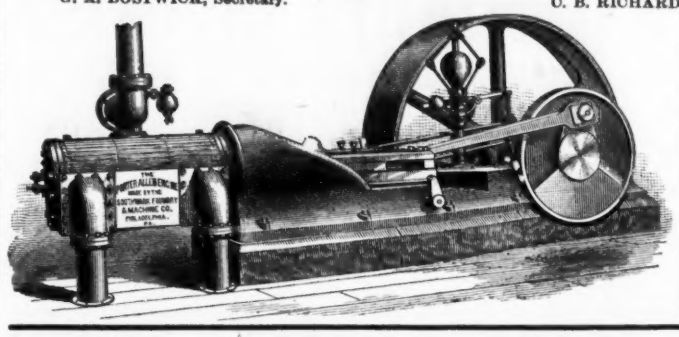

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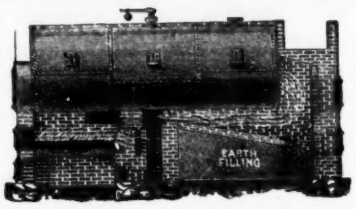

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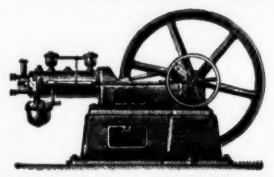

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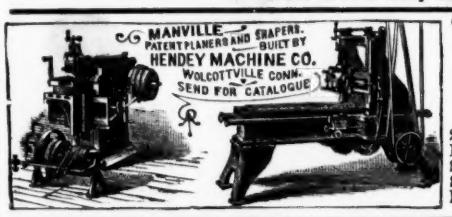

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1 30 in. x 30 in. x 8 ft. Planer New. May.
1 42 in. Swing, 16 ft. bed. New Engine Lathe. June.
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1 36 in. " 18 ft. " " " " "
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1 22 in. swing, 13½ ft. Bed Engine Lathes. "
5 22 in. x 12 ft. Engine Lathes. May.
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2 9 in. Shapers. New. May.
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2 18 in. " 8 ft. " " "
1 18 in. " 8 ft. " " Tilting carriage
1 18 in. " 11 ft. " " "
1 17 in. " 7 ft. " " Second-hand.
1 12 in. " 4 ft. " " New.
2 11 in. " 5 ft. " " "
1 15 in. " 9 ft. Hand Lathe. New.
3 12 in. " 6 ft. " " "
1 10 in. " 4½ ft. Bed Hand Lathe. New.
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1 2 Spindle Drill. New.
1 4 " " "
1 3 " " Second-Hand.
2 4 " " "
2 Wall Drills, heavy. Second-hand. 60 and 72 in
1 9 in. Shaper. New.
1 9 in. " 2d-hand.
7 Lincoln Millers. Pratt & Whitney. 2d-hand.
4 " " Phœnix Iron Works. 2d-hand.
1 Pratt & Whitney Hand Miller.
1 Sellers Milling Machine. 2d-hand.
1 Face Milling Machine. Second-hand.
1 Pond's Double Milling Machine. 2d-hand.
1 No. 2 Screw Machine. New. Turret Head.
1 No. 2 " Wire Feed. New.
1 No. 1 " Pratt & Whitney. 2d-hand
1 No. 3 " " " "
1 Screw Head Slotter. Second-hand.
3 Second-hand Profiling Machines
3 4½ in Hyde's Patent Centering Machines. New.
1 Emery Grinder, 2d-hand. for 10 in. Wheels.
1 Pipe Cutting Machine. Second Hand. 2 in.
1 1 in. Wood & Light Bolt Cutter. New.
1 Bolt Pointing Machine. Second-hand.
1 Double Nut Tapper. New Horizontal.
1 Horizontal Boring Mill, 54 in. Swing.
1 Horizontal Boring Machine, 10 in. Swing. 2d-hand.
1 Betts, No. 2, Power Punch. New.
4 Double-Acting Presses, No. 3, nearly new.
4 Single-Acting Presses, for power, "
100 Foot Presses, nearly new.
1 Medium Power Punching Press. Second hand
2 Small " " Presses. "
1 Foot Punch, with bench. New.
1 Lot Pistol Machinery. Second-hand.
3 Grind Stones and Frames.
1 Steam Hammer. Cylinder 6½x18. 2d-hand.
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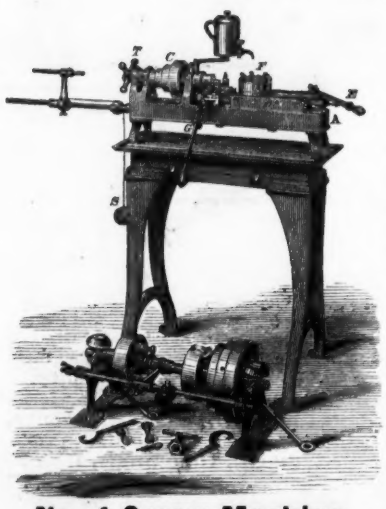

No. 4 Screw Machine.

The No. 4 Screw Machine is of the same general construction as the one previously described, but much lighter and especially intended for making the smaller screws that are used by sewing machine manufacturers, gun-smiths and clock-makers. The spindle has a hole bored through it seven-sixteenths of an inch in diameter, and is provided with a patent device for opening and closing the jaws in the chuck, which holds the wire from which the screws are made.

This operation of opening and closing the jaws of the chuck is performed in an instant without stopping the machine, and effects a great saving of time in making small screws. The revolving head is made entirely of steel.

Size of hole through spindle, 7-16 inch; size of holes in revolving head, 9-16 inch; length that can be milled, 2½ inches. Friction Pulleys on counter-shaft are 7½ inches diameter and 2½ inches wide. Counter-shaft should run 260 turns per minute. Weight of machine prepared for shipment, about 500 lbs.

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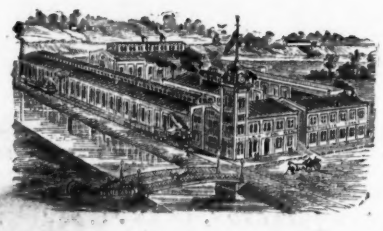

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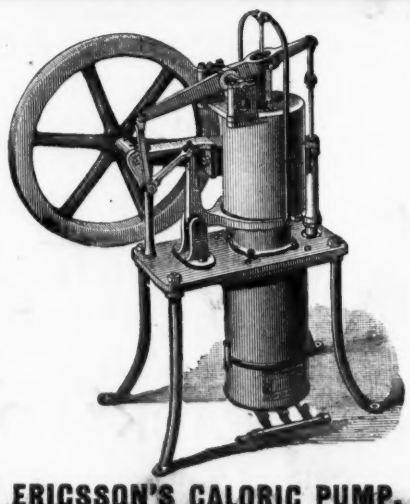

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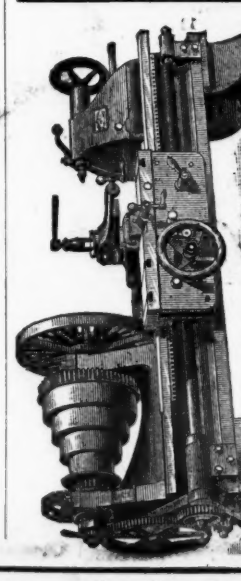

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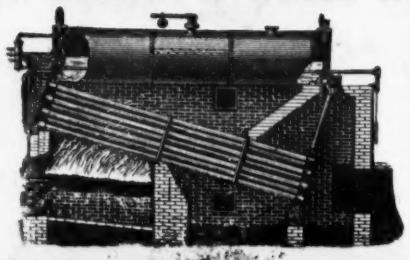

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